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LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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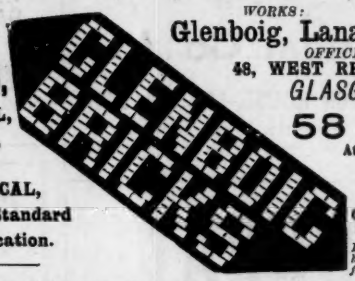

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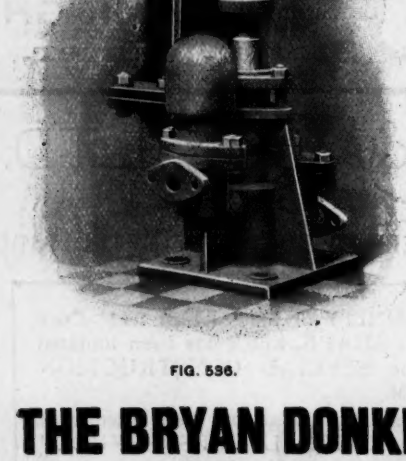

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EDITORIAL NOTES.

The Act and the Year.

WHAT of the New Year? It does not open auspiciously. There is a trade slump of uncomfortable magnitude, and unemployment is rife. The country and indeed the world are suffering more acutely now than at any period since the armistice from the issues of the great war. All this will, while it continues, influence the fortunes of every industry. None can escape; but all can work for amelioration, and hope for it speedily. But whatever the general conditions, the gas industry has immediately at hand much work of the highest importance. In the Gas Regulation Act of last year, a new foundation was laid for it, upon which without delay it has to begin to construct; and every section of administrative and official life in the industry will have to apply itself to the task. The more one examines the Act, the more extensive appear its ramifications and possibilities. Superficially, it does not perhaps seem much to have the basis of trading changed from volume to heat energy; but the freedom to develop on economic lines is something that contains enormous potentiality. The freedom is given by permitting an undertaking to "declare" the calorific value of gas that best suits its economic conditions and environment, and by having conferred upon it the ability to modify the declaration, with the consent of the Board of Trade. The freedom (which carries with it the necessity for charging upon the heat-unit basis) brings fresh scope to active research and invention for the provision of plant which will enlarge the production of saleable B.Th.U. per ton of coal treated, and for the devising of appliances which will increase efficiency in the use of the heat energy supplied and paid for. There is big work here. If two B.Th.U. can be produced where only one was produced before, and this by some reduction of the heat hitherto expended in the work, and if one B.Th.U. can be got to do the same amount of useful work as two B.Th.U. did before, the aggregate increase in the efficiency of the gas industry will be of a stupendous order, and the raw material saved of national and material importance.

It is (as we say) a large task that the industry has before it; but it is better to have this task with its imposing train of possibilities than to have continued the limitations to development that have heretofore had statutory existence. But the task must be attacked philosophically and seriously, and with the intention to achieve, always sensible of the fact that it is progress the industry is out to win—progress which means extended service to the community, and so greater stability for the industry. Every increase in stability means longer life and greater vitality; and while such increases continue, the gas industry may confidently think of itself in terms of permanence. The progress, however, in the new constructive work must be gradual, in order that every step may be carefully guarded and fully assured. Attempted big flights or giant strides must be deprecated. There are men with large ideals and distant goals which they would fain materialize at once, or reach at a single bound. The ideals and the goals may be quite good; but there is much that is intermediate, and that must not be wrecked. The industry has something existing that is very valuable; and it is from the stage of what exists that its responsible men have to work. Evolution is the correct and surest process, and not revolution; and evolution will materialize ideals and enable us to reach goals with more safety than revolution, which has very often proved destructive. The warning is not by any means universally required in the gas industry; but there is a call for it. At the same time, we are not among those who are content with the shuffling movements of old age; but we are of and with those who desire to advance with prudence, and not leave a mass of trouble in the rear which may be very irksome and, in the long-run, delaying. There is, of course, no finality to development; but well-ordered progress over well-explored and so certain ground will be more in keeping with the established position of the gas industry, with its diverse manufacturing and trading activities, and its aims.

Work with a view to development of economy and efficiency has already been begun. It has been going on for some time past. But all the time the industry has been suffering from a sense of retarding limitations to power and application. The Gas Regulation Act has altered this; and in this new year the Orders from the Board of Trade and Bills in Parliament will open-up the ground for constructive work to which no one can set boundaries. True development is generative of more.

Special Heat-Unit Articles.

To mark the opening of this constructive year and the new work presented by the Gas Regulation Act, we have arranged for the publication of a special series of articles, under the title of "The Gas Industry on the Heat-Unit "Basis." These are being contributed by men of responsible position in the gas industry, and by specialists. Week by week until they are finished, something fresh will be opened-up; and they will show plainer perhaps than has been done before what the Act means to the industry, the vastness of the area of new opportunities, and the large extent of work that confronts from the heat-unit producing plant, through distribution, and on to utilization in the home and the factory. The series begins to-day.

"The Genesis and Development of the Gas Regulation "Act" is the subject of an historical narrative, which appropriately starts the series, and which is presented to our readers by Mr. D. Milne Watson, the President of the National Gas Council. Many succeeding generations of gas men will be anxious to have in clear and succinct form an account of those things which led to the change from trading in volume to heat energy, and from the old statutory financial terms to the new, and which enlarged the liberties of the industry to the general advantage. It is a history that shows to those who read aright untiring zeal and resolution standing out and encountering pitiless opposition to the meting-out of justice to the industry. It was a long road that had to be traversed; but perseverance and good statesmanship won. Organizations and men who took part in the initial work and all that followed before final success was achieved have their names put on record in the article. No one has had greater prominence in the history of those times of cloud and contest, of conference and diplomacy, of profound anxiety with few rays of brightness breaking through, than Mr. Milne Watson, who has lived and worked more behind the scenes than he has done in front of them, confident that justice would carry him and all his associates to ultimate success. The success is embodied in the Gas Regulation Act, about which the first contributor to the series of articles writes: "It is too early to say what the "effect of this great new charter for the gas industry may "lead to; but it can, without doubt, be said that it opens-up "a prospect of progress and development, the great possi- "bilities of which cannot as yet be fully estimated."

"The Economic Value of the Act" is the text on which Mr. Thomas Goulden, M.Inst.C.E., the President of the Institution of Gas Engineers, writes. He does not touch the question of financial revision, as is done in the historical narrative. But very properly as a gas engineer he looks at

the Act to see what it contains for him and his professional fellows; and he sees in it something which is fertile in opportunity. The sale of therms he looks upon as a natural outcome of the experiences gained by those who in 1912—the South Suburban and Wandsworth Gas Companies—and the Gas Light and Coke Company and other concerns in 1914 (experience has since spread), abandoned the illuminating power standard for the calorific value one. He is right. Without this development and experience we should not be where we are to-day in the matter; nor would the gas industry have been in possession of so much of economic value. The work of the engineer will be to secure the maximum heat value from the coal and plant he uses, and put the maximum heat value through his distribution system. At the same time, the needs of the country in respect of the production of tar and ammonia must not be overlooked. How these *desiderata* are to be realized is the problem. Like his professional contemporaries, Mr. Goulden will not make any pronounced prediction. But it is a proper thing to attempt to vizualize what may be from the conditions as they are seen at present. And the President of the Institution is of opinion that a greater proportion of coke will be gasified simultaneously with the carbonization of the coal from which it is produced; and, the heat expended in the process of carbonization bearing so serious a proportion to the heat potential of the coal carbonized, he looks forward with considerable anticipation to the early development of some form of gas production in which the heat necessary for the carbonization of the charge will be mainly secured within the retort. In fact, he goes so far as to say that the successful operation of plant of this type will, he believes, prove the ultimate solution of the carbonization problem. This will hearten the various investigators who are operating along this line.

The Therm Basis in Parliament—Abandoning the Sliding-Scale.

LAST session the Legislature gave, in the Gas Regulation Act, its approval to the gas industry's passing from the sale of gas by volume to trading in gas upon the basis of its heating value. And simultaneously it sanctioned, through a Special Act, the same change in the case of the South Metropolitan Gas Company, who also took the step of securing authority to abandon the sliding-scale in favour of a scheme of dealing with profits which secures to the stockholders a fixed dividend, and gives statutory right to consumers, stockholders, and employee co-partners to share, in defined proportions, in surplus profits, when the charge for gas is below the basic price. In the coming session, apart from the work that is being done at the Board of Trade under the powers of the Gas Regulation Act, the constructive work commenced last year in Parliament will be continued there by several gas undertakings having chosen for various reasons this route to become endowed with the right to work on the new lines, and to secure rehabilitating revision of financial terms. A study of the Bills dealing with the heat-unit basis satisfies us that any illusions there may have been as to difficulties in legislating on the new basis are already vanishing, and that soon gas undertakings will be legislating on it as though it had always been. There is one thing that is a little astonishing, and it is that there should be any gas undertakings, with the Gas Regulation Act in existence, proposing terms on the ancient bases of prices per 1000 cubic feet, and standard calorific power, and not "declared." Manchester is asking for a 450 B.Th.U. standard; the Radcliffe and District Joint Gas Board for a 500 B.Th.U. standard. One gas undertaking, living presumably in the long distant past, desires that "the prescribed illuminating power shall not be less "than 15 candles." Some of the promoters are proposing minimum pressures of 15-10ths, and one Bill names 8-10ths. Of course, it may be the intention to correct all this by making independent applications to the Board of Trade for Orders. But, if so, why do the work twice over? We should not be surprised if the Private Bill Authorities take the necessary steps to bring about co-ordination in various respects with the terms of the Gas Regulation Act.

There are three of the Bills which are of special interest —those of the Cardiff, Harrogate, and Swansea Gas Companies—because they have adopted the South Metropolitan innovation of dealing with profits by proposing a minimum statutory dividend, with an additional payment to the proprietors (if only the balance of net revenue will allow) when the charge is below the basic price, as well as giving to the employee co-partners the statutory right to an equal share with the stockholders in the surplus profits. This is a change which will make for stability in respect of capital values and dividends and in the interest and fidelity of all working in an undertaking. It is an equitable arrangement; and it makes stronger than ever before the bond of mutual interest between the consumers, stockholders, and workers. This in these disturbed days is a desirable thing; and when times become more tranquil, the new conditions will tend to maintain peace. In the case of the Harrogate Gas Company, the amount to be equally divided between the proprietors and the employee co-partners is the same as in the South Metropolitan Gas Company—one-third of the consumers' share, which share is the sum represented by the difference between the basic price and the actual charge below the basic figure multiplied by the therms sold. In the Cardiff and Swansea cases, the proposal is that the share of the proprietors and the employee co-partners shall be one-half of the total sum by which the consumers have benefited in any year or half year by way of reduction in charge below the basic price. Of course, all suggested terms will have to be judged separately for each undertaking, as working conditions are in no wise identical. While Harrogate is asking for a basic price of 11·2d. per therm, and 10 p.ct. dividend on the consolidated stock, Cardiff proposes a basic price of 1s. 7d. per therm in the city and higher figures elsewhere, and 6 p.ct. dividend on the existing ordinary capital, and 8 p.ct. on any ordinary capital issued after the passing of the Act. The basic price proposed by the Swansea Company is 1s. 11⅜d. within the borough and a distance of a mile from the borough boundary, and somewhat higher elsewhere, with dividends as contemplated by Cardiff. This is not the time to discuss these proposals; but we may express the hope that a more sensible view will be taken this session than was taken by a Lords' Committee last session as to what is a fair dividend for the holders of existing gas stock in these times of depreciated money values and of difficulty in securing any new capital unless advantageous terms are offered.

In another respect the Harrogate Gas Company have taken a leaf out of the South Metropolitan book. It is this: If the Chief Gas Examiner certifies that in any year the testing of the gas has shown it to contain on the average less than 1 part by volume of carbon bisulphide vapour per 40,000 volumes of gas, then it is proposed that there shall be taken into the calculation for the purpose of the section dealing with the division of surplus profits, in lieu of the sum actually payable by the consumers, a sum which would have been so payable if the price charged for gas had been less by ½d. per therm than the price actually charged.

The Colne (Lancs.) Corporation and the Tendring Hundred Water and Gas Company also adopt in their Bills the therm basis. The former propose 1s. 4d. per therm; the latter, 1s. 7·6d., and 2d. more when the Company have commenced to manufacture gas in works to be constructed on lands specified in the schedule to the Bill. For the hire of a prepayment meter and fittings, the Colne Corporation are proposing 4d. per therm, 6d. if a cooker is included, and 3d. for meter only, or 10 p.ct. on cost, whichever is the higher. The Tendring Hundred Company suggest 2·2d. for meter and fittings, 2·8d. if a cooker is included, and 1·4d. for meter only. The Harrogate Company contemplate 2d. for meter and fittings, 1d. for meter only, or 10 p.ct. on cost, whichever is the higher. Regarding gas pressures, the Cardiff and the Swansea Companies desire that they shall be under no obligation to supply gas at the minimum permissible pressure defined in the Gas Regulation Act till a date to be fixed by the Board of Trade, and that such Order may prescribe different minima pressures for different parts of the limits of supply. This is quite in accord with the Act itself. The Harrogate Company desire that in the case of premises situated at a lower level than 200 feet above Ordnance Datum, the pressure shall be 1½ inches; and to premises at a higher level, 2 inches.

Some of the promoters are seeking powers to specify internal piping and fittings, which is a matter of considerable importance to ensure efficiency in utilization in these days when manufacturing economy may suggest varying the characteristics of the gas supplied. Another interesting point is found in the Harrogate Bill. The Company are seeking in respect of new supplies the option of requiring the repayment to them of the cost of providing, fixing, and laying meter and main (or an extension of main),

and service-pipe, or of entering into a written contract to pay for a supply of gas, for a period of at least five years, of such an amount that the rent payable shall not be less than 30 per cent. per annum on the outlay. At the same time, it is to be provided that it shall be lawful for the Company, in any case in which they may think fit to do so, to provide at their own expense any meter or pipe.

The Bills referred to in this article will alone make the coming session interesting; and there are others which will be noticed in our customary review, the first part of which appears in other columns this week.

Railway Rates.

WITH 20 million tons of coal, 9 or 10 million tons of coke, and an unestimated weight of oil and other manufacturing materials, as well as tar, ammoniacal liquor, sulphate of ammonia, plant, and other goods to be transported in one way or another, gas undertakings are considerable patrons of the railway systems of the country. Rates and charges for conveyance and services rendered have always been a thorny subject, more especially since running costs have risen some 200 p.ct., and have necessitated liberal increases in the rates and charges levied. Between the traders and the railway companies, grievances have been continuous; and it is highly desirable that some new machinery should be put into operation which will do justice to both the companies and the traders and customers generally. Such machinery is proposed in the report of the Rates Advisory Committee to the Ministry of Transport which was issued last week, and in which some far-reaching changes are recommended in the methods of fixing rates and charges. The report deals with the principles which should govern the fixing of rates and charges for services rendered; and the greatest change proposed is that a permanent, competent, independent, whole-time tribunal should be appointed to fix actual standard rates and tolls, and to decide upon all classification questions. If the plan be adopted, the principle of fixing maximum scales, and allowing the companies to determine actual rates within these scales, will be abandoned. In fixing standard rates, it is suggested that they should be put at a level which will pay all costs and provide a fair rate of profit. There can be no valid objection to this. While, however, uniform rates for all railways are considered desirable, it is doubtful whether this could be effected. It is obvious it could not be. Another thing is that standard rates must be subject to revision. If large economies are, as the Ministry of Transport hope for, going to be secured by railway reorganization schemes, then standard rates fixed now should, as a result, show a decline. Power to revise is one of the recommendations; and it is suggested that any body of traders representative of interests affected should have the right of appeal. Another improvement would be that collection and delivery charges should be kept separate from conveyance charges, and that terminal charges and costs incurred in connection with services rendered upon private sidings should also be kept distinct. Conveyance rates should be a mileage rate per ton on an ascending scale according to the classification of goods; but the mileage rate should be upon the cumulative principle, with a descending scale of rates as the distance increases. When, too, goods are taken over two railways, the rate should be on the basis of continuous mileage. Further—this the gas industry would willingly endorse—a lower classification should be agreed when goods are carried in large quantities. The report covers considerably more ground than is indicated here. The principles appear to be sound, and should have the effect of materializing the spirit in which they are put forward. Whether or not they could be further improved is a matter for technical judgment and actual experience.

The Gas Referees.

From now onwards, the body hitherto known as the Metropolitan Gas Referees are to be called by the abbreviated title of "The Gas Referees." "Metropolitan" has been finally deleted in conformity with the Gas Regulation Act and the expansion of the sphere of the Referees' operations from the Metropolis throughout the United Kingdom.

The Sutton Amalgamation.

The Directors of the Sutton Gas Company and of the Wandsworth, Wimbledon, and Epsom District Gas Company have, as has already been intimated in the "JOURNAL," entered into a provisional agreement for the amalgamation of the former with the latter. The stockholders of the smaller Company, or rather a highly influential part of them, are up in arms against the proposal; and a halt has been called until they have before them full details. So far as one can judge in the present conditions, it looks very much as though the scheme will be vetoed by the stockholders, and on grounds which are considered by competent gas-engineering proprietors to be perfectly good ones. A circular-letter was sent out by a number of the dissenting stockholders; and when it is learned that no less than 132 proxies were secured against the proposals out of a possible 295, this indicates the existence of a very strong feeling among the proprietors that the terms offered are inadequate for what is unquestionably a very valuable property. The area supplied is one of the best residential districts outside London, and is an ideal one from a gas company's point of view, as there is plenty of room for development. The Company have done well for the consumers, who, we hear, are also strongly opposed to the change of ownership. The capital employed, for the size of the works, is one of the lowest in the country, and the charge for gas is extremely moderate. The average price for 1918-19 was practically the same as for the Wandsworth Company. A special meeting of the stockholders was held on the 21st ult.; and by a resolution proposed by Mr. J. Ferguson Bell, seconded by Mr. R. J. Milbourne, the meeting was adjourned until Feb. 1, to enable a Committee of five stockholders to report upon a thorough investigation they are meanwhile to make into the matter of the provisional agreement, and other questions associated with the proposal. On the other hand, it will be seen from the report published last week [p. 774] that Mr. W. Doig Gibb and Mr. Ernest W. Drew, F.C.A., consider the terms and conditions under which amalgamation would take place are advantageous to the Sutton proprietors.

Directors and Transfers of Property.

We have no special interest in this particular case, beyond the general one that in our opinion it is only right that Directors should take the precautionary and fair step of ascertaining the views of the owners, for whom they are only trustees, before entering into provisional agreements for the sale or transfer of their property. The trouble at Sutton should convey its lessons elsewhere, and especially in these times when dividends upon, and values of, stock have been so heavily depressed by circumstances beyond the control of anyone associated with gas undertakings. Stockholders will stand a good deal; but there are limits. The revolt at Sutton indicates that in this instance the breaking-point was passed. The question of compensation payable to the Directors upon transferring companies was strongly commented upon at the meeting. In the opinion of Mr. Ferguson Bell and others, it is time legislation was passed to prevent large sums being paid to directors upon transfer or amalgamation of public companies; and it is hoped by them that Sir Stanley Johnson, M.P. (who is prominently associated with the dissenting stockholders), will initiate long overdue legislation to deal with the matter. This is a subject to which the "Daily Telegraph" some few months ago drew attention. Our contemporary characterized the present system as immoral, seeing that directors have no saleable interests; and so it was considered it should be made illegal to pay compensation to those who are merely the representatives of the selling proprietors. We shall await with interest the development of the position against which such strong protest has been made; and the further particulars which should result will no doubt enable the formation of a perfectly independent opinion. We are not in the circumstances inclined to jump to the conclusion that there is nothing to be said on the other side.

Modern Heating for New Houses.

When Lord Newton, Chairman of the Departmental Committee on Smoke and Noxious Vapours Abatement, recently drew the notice of the House of Lords to the scant attention that had been paid to the recommendations of his Committee regarding the introduction in the housing schemes of methods for using gas and other smokeless fuels, the Ministry of Health were ready with a promise that a memorandum on the subject should be issued to the authorities dealing with the provision of houses. This has now been done; and Dr. Addison in it expresses the hope that, so far as local conditions will permit, effect will be given to the

Committee's suggestions. Even where schemes have been commenced, the Minister trusts that local authorities will modify the heating and cooking arrangements of the dwellings, provided that this can be done without materially increasing the costs. It does not convince one that effective steps were taken to bring the matter to notice before this, nor does the fact that houses have been springing-up with the same expenditure as of old incorporated for useless chimneys and fireplaces, which could, except perhaps in the living rooms, have been saved, and the money devoted to modern labour-saving and smokeless appliances. An opportunity has, at any rate, been partly missed. The economy cannot be carried out now in built houses; but it should be in houses still to be erected. The memorandum gives strong recommendation to gas-fires and coke-heated appliances. In connection with cooking, it is remarked that where gas is not available, the alternative should be considered of electric cooking, where the supply of current can be secured at a low rate. This is a curious suggestion for such houses. What is a "low rate" in relation to the potential and useful value of the unit of heating energy? Like gas, electricity is labour saving. But it is not time or pocket saving; and the working man does not want to pay expensively for the saving of labour. Whether Lord Newton will be satisfied with the circulation of this memorandum remains to be seen. His idea is that the Ministry of Health should keep pegging-away at the matter. An attack is being made on well-entrenched custom, which will require a good deal of battering to destroy it.

Heat-Resisting Glassware.

The other week at the meeting of the Illuminating Engineering Society, the Gas Lamp and Lighting Appliances Committee reported that they viewed with considerable anxiety the present inadequate supply and great cost of glassware and mantles, and expressed the opinion that the prohibition of its importation would place the gas-lighting industry in an extremely serious position, and it should not be hampered by any restrictions. The writer of an article in the "Daily Telegraph" the other day dealt with the question of the defence of home key industries. One of his illustrations referred to heat-resisting glass, and to its importance in connection with incandescent gas lighting, which requires glass of specially good heat-resisting qualities. Before the war such glassware very generally bore the mark "Made in Austria." The writer points to the long investigations made by the technical staff of Messrs. Chance Bros., which resulted in the discovery of a combination of elements which produced a glass "certainly as good as that of German make, probably better, for all heat-resisting purposes." This glass now goes into households, shops, factories, and street lamps, and is used for high-pressure lighting. Large numbers of British workpeople are engaged in its production. A considerable sum of money has been invested or exhausted in research; but the new industry has been put on a commercial footing. It is submitted in the article that unless this heat-resisting glass (which is closely allied to scientific glassware) is treated as a key industry, it has small chance of surviving. Losing no time, the Germans have sent huge quantities into this country. Cheap labour and the position of the mark in the exchange give them advantages against which the British manufacturer cannot compete. Their quoted prices are lower than the British first cost. The writer asks: "Is yet another industry, built up in the war years with much toil and cost, and the loss of which will mean further unemployment for our own craftsmen and artisans, to be handed over to the stranglehold of German monopoly? That is a question to be decided; and a decision must be come to before it is too late."

The Government and Home-Produced Motor Fuel.

The National Benzole Company are completely justified in making a protest against the action of the Government in taking the duty off imported motor spirit, and placing a tax on vehicles and cars using motor spirit whether home-produced or imported. It is obvious that this means, at one movement of the pen, the striking-off of the encouragement to the production of home-made motor spirit, which, despite its higher effective power per gallon, has to fight against strong interests. Of course, it is now possible for the petrol importers to reduce their prices commensurate with the abolition of the duty; and benzole has perforce had to come down 3d. This happens just at a time when the National Benzole Company were busy trying to stimulate production by being in a position to offer better terms for the crude product. If this is the way the Government propose to help to make this country more and more independent of supplies of a vital necessary from across the seas, they are going to work in a manner which will have a diametrically opposite effect.

Gas-Cooker Research.

The manufacturers of gas-cookers will be considerably interested in the investigating tendency abroad to-day among the juniors of the gas industry, who are out for securing higher efficiencies for the consumers of gas. Their researches are showing where the defects in design and construction exist that lead to the waste of heat, which spells uneconomy. The latest contribution to the subject has been made by Mr. W. Heathcote, of Halifax, in a paper before the Yorkshire Junior Gas Association. His tests show that ovens and hot-plates from different sources vary greatly in their efficiency, which means that the heat losses between different makers' productions vary widely. It is all a matter of proper design and construction. The makers are not neglecting the matter; they are investigating and working to make the necessary corrections. Gas is going to be sold on the heat-unit basis. Why should not gas undertakings make their purchases of cookers after putting them through tests to ascertain which give the best all-round efficiencies?

The Miners Win.

The miners have won the 1s. 6d. per shift addition to the 2s. awarded them under the strike settlement. The Secretary of Mines announces that the wages will be increased from Jan. 3 to 31 by the following amounts: 3s. 6d. per shift to workers of 18 years and over, 1s. 9d. to those of 16 and 17 years, and 1s. 3¾d. to those under 16 years of age. During the week ending Dec. 18, a new record was made in output. It amounted to 5,307,000 tons, against 5,205,400 tons in the preceding week. The five weeks ended Dec. 18 was the output test period fixed by the Government under the strike settlement. The miners were told that if they produced between 258,000,000 and 262,000,000 tons a year of fifty weeks, they would get an extra 3s. 6d. a day from Jan. 3, and that when their output reached 266,000,000 tons they would get 4s. a day extra. At their latest rate, they are producing at the rate of 265,350,000 tons a year.

Mechanical World Year Book.—The 1921 edition of the "Mechanical World Year Book" (published at the price of 2s. 6d. net, by Messrs. Emmott and Co., Ltd., of Manchester, and No. 20, Bedford Street, London, W.C.) contains several new features, in addition to all the useful information which has been gradually compiled during the long period of publication—extending now to well over thirty years. There is a new section on cast tooth-gearing, containing tables and data which it is felt should suffice to meet all practical requirements in this connection; another (also with tables, notes, and data) on ball and roller bearings; and one on friction and lubrication, with particulars of lubricants and lubrication methods. Some fresh illustrations have been incorporated with the matter; and there is a diary for the year which has just opened. Looking generally at the tables, one recognizes there must be an unlimited number of occasions on which they have been, and will again be, of use; and the satisfying of any one of these requirements is probably worth far more to the inquirer than the small sum that is asked for the year book.

New Chemical Works Regulations.—New regulations are proposed under the Factory and Workshop Act to apply to chemical works; and these will supersede the special rules which were first established in 1894. Chemical works as here defined include works for the manufacture or recovery of ammonia and salts of ammonium, and for the distillation of tar. It has been recognized that in certain classes of chemical works special dangers exist which are not found in other branches of the industry; and for this reason the regulations are divided into two parts, the first of which is applicable to all chemical works as defined in the schedule, and the second [which includes tar works] to those only in which special dangers need to be dealt with. Care has also been taken to avoid overlapping with the regulations under the Alkali Works Regulation Act. In accordance with the provisions of the Factory Act, it is necessary for the regulations to be formally published in draft before being made; and they are now so published. If objections of substance are taken to them either by the occupiers or by the workpeople, or by any other persons affected, and the Secretary of State cannot see his way to amend the draft regulations, these objections will be the subject of full inquiry. At the inquiry, employers, owners, occupiers, and workpeople, and all others concerned, will be entitled to a full hearing.

THE GAS INDUSTRY ON THE HEAT-UNIT BASIS.

Special Articles.—I.

THE passing of the Gas Regulation Act is an important epoch-marking event for the gas industry; and this year will witness its first fruits. In view of this, we have secured the collaboration of a number of gentlemen prominently identified with the industry in contributing a series of articles bearing upon the transfer of the industry from trading upon the basis of volume to that of heat energy; and their contributions will be published week by week. Fittingly, a beginning is made in this first number of the year with an article, on "The Genesis and Development of the Gas Regulation Act," by the President of the National Gas Council (Mr. D. Milne Watson), followed by a contribution by the President of the Institution of Gas Engineers (Mr. Thomas Goulden, M.Inst.C.E.).

THE GENESIS AND DEVELOPMENT OF THE GAS REGULATION ACT.

AN HISTORICAL NARRATIVE.

By D. MILNE WATSON, President of the National Gas Council.

FOR some few months after the outbreak of war, the industrial position and the prices of materials and food remained practically stationary. It was not until the beginning of 1915 that there was an upward movement in prices, and consequently a demand for increased wages; and from that time onward the prices of materials and food kept advancing, and renewed demands were continually made for increases in wages. The upward movement became accentuated, until it was apparent that the great war was to be accompanied by a great industrial upheaval. As time went on, and largely increased quantities of munitions were required for the Army and Navy, the Government was forced to make special efforts to induce manufacturers to increase their output.

THE ADVENT OF FINANCIAL HARDSHIP.

After a year or two of war conditions, it became evident that the position of the gas industry as a whole was becoming very serious. The sliding-scale companies were naturally affected before the maximum-price undertakings, as the increased price of gas, due to the growing cost of labour and materials, seriously reduced the dividends. The question arose as to what was to be done in the best interests of the industry. Suggestions were made in certain quarters that it would be advisable to approach the Government for the purpose of guaranteeing dividends, as had been done in the case of the railway companies, inasmuch as gas undertakings were being called upon to provide at a loss materials—such as toluol, benzole, &c.—necessary for the manufacture of munitions of war. Such a step would practically have meant that the gas industry would have become controlled by the Government in the same way as the railways; and, after much careful consideration, it was felt that it would be unwise to suggest this, as it would probably have involved the industry in the loss of its freedom for all time. It was considered better to face the known difficulties, rather than embark on a course which might bring about even more serious troubles in the future.

INITIAL MOVEMENT—DEPUTATION TO THE BOARD OF TRADE.

Matters went from bad to worse; and in June, 1917, it became apparent that the industry could not go on without immediate financial relief of some kind, as dividends had either vanished altogether or were on the point of doing so. Accordingly, on the 31st of July, 1917, a meeting was held of a Special Committee of representatives from the various Gas Managers' Associations and Institutions throughout the country, together with representatives of the Executive Committee of the National Gas Council. At this meeting it was decided to ask the President of the Board of Trade to receive a deputation, in order to lay before him the serious position of the industry. On the 9th of October, 1917, a general meeting of the National Gas Council was held, when a number of resolutions were passed containing proposals confirming the decisions come to by the Executive Committee. The deputation from the National Gas Council was ultimately received by the President of the Board of Trade, Sir Albert Stanley (now Lord Ashfield), on the 24th of October, 1917. This deputation included the following Members of Parliament: Sir Henry Cowan, Sir Fortescue Flannery, Bart., the Rt. Hon. Sir Daniel F. Goddard, Mr. R. J. Neville Neville, and Mr. W. F. Perkins. The Rt. Hon. Sir Daniel Goddard and Sir Fortescue Flannery introduced the deputation.

The speakers on behalf of the industry were: Mr. J. R. H. Jacobs, Mr. H. E. Jones, Alderman F. S. Phillips, and Mr. D. Milne Watson. Various suggestions were made, mainly in the direction of a percentage addition to the reduced dividends in the case of the sliding-scale companies and of increases to their maximum prices in the case of maximum-price undertakings.

The President of the Board of Trade, in his reply, stated that he realized the seriousness and importance of the problem, and that the matter would receive his very careful attention, and would be dealt with expeditiously. He advised the selection of a small Sub-Committee for the purpose of further discussing the subject with him. This Sub-Committee consisted of the following: Mr. J. R. H. Jacobs, Alderman F. S. Phillips, the late Mr. Thomas Waddom, and Mr. D. Milne Watson (the Chairman of the Executive Committee).

A FAMOUS INQUIRY, AND A LEAN RESULT.

In November, 1917, some twenty-five companies gave notice of their intention to promote Private Bills in Parliament dealing with their financial position, as a result of which a Select Committee of the House of Commons, presided over by Sir W. Middlebrook, was appointed on the 22nd of April, 1918, to consider and report whether provision should be made for the temporary modification of statutory requirements with regard to price and dividend in the case of gas undertakings whose circumstances had been injuriously affected by causes arising out of the war. The witnesses who appeared before the Select Committee on behalf of the gas industry were as follows: Dr. Charles Carpenter, Mr. William Cash, Mr. J. R. H. Jacobs, Mr. T. P. Ridley, Mr. E. Upton, Mr. D. Milne Watson, and, as specially representing the Gas Companies' Protection Association, Mr. W. A. Scott and Mr. R. Bruce Anderson.

After the Committee had heard evidence on behalf of the gas industry and the evidence of the opposition, they reported on the 11th of June, 1918, to the effect that it had been shown that in a large number of cases the dividend had decreased below the standard dividend, and, in a few cases, had disappeared altogether. The Select Committee recommended that:

> "With a view to maintaining, in the public interest, the stability of gas undertakings, relief should be granted to gas companies working under the sliding-scale or maximum-price systems to the following extent—viz., that they should be authorized to charge such a price for gas as would provide sufficient to enable them to pay a dividend at the rate of one-half the standard dividend or one-half of the pre-war dividend, whichever might be the smaller."

FURTHER EFFORTS.

Needless to say, the greatest disappointment was felt by the industry at the inadequacy of the relief recommended by the Committee, especially after the statement in their report that they had made their recommendations with the view of *maintaining* in the public interest *the stability of gas undertakings*. Accordingly, a deputation waited on the President of the Board of Trade on the 21st of June, 1918. The speakers on behalf of the Gas Bills (Financial Hardships) Committee were as follows: Mr. D. Milne Watson (who introduced the deputation), Dr. Charles Carpenter, Mr. G. Clarry, Mr. A. F. Phillips, and, as representing the Gas Companies' Protection Association, Mr. H. E. Jones and Mr. E. Campbell Cooper.

The deputation pointed out that the recommendations of the report came as a very severe blow to the industry. The report of the Committee showed clearly that, while they had been convinced of the justice of the case, they had not provided the necessary relief. The President said that, if the deputation suggested

that the Government should introduce a Bill providing for relief in excess of that stated in the report of the Select Committee, they were asking for something practically impossible, and intimated that any argument which the gas industry wished to put forward in favour of a greater measure of relief should be brought before the House of Commons when the Bill was being considered.

The Statutory Undertakings (Temporary Increase of Charges) Act—A Small Gain.

Shortly afterwards the Government introduced a Bill based upon the recommendations of the Select Committee. Representatives of the industry in the House of Commons (including Sir Ryland Adkins, Sir Fortescue Flannery, the Rt. Hon. Sir D. F. Goddard, and Mr. R. J. Neville Neville) argued strongly for more substantial relief; and, as a result, the Government was induced to take off the Government whips and leave the House to decide for itself what relief should be given to the gas industry. Finally, on the motion of Mr. Tennant, the House allowed the payment of three-fourths of the standard or pre-war dividend, whichever was the smaller, instead of the half recommended by the Committee. This was on the 22nd of July, 1918.

In the House of Lords an attempt was made to reinsert the "half;" but, fortunately, this was defeated, and the industry is under a considerable debt of gratitude to Lord Faringdon for his assistance in the vindication of its case. The Statutory Undertakings (Temporary Increase of Charges) Bill became law on the 8th of August, 1918.

Although disappointment was generally felt that the relief granted by the Act was not more substantial, it was realized that a great concession had been made by the Government when it took off the Government whips and left the House to decide whether or not to adopt the recommendations of the Select Committee.

The National Gas Council and More Permanent Relief.

While thankful for what had been obtained, the National Gas Council felt that matters could not rest there—especially in view of the fact that it was by this time apparent that the new state of things in the industrial and financial world was only too likely to be of a permanent character, and that no temporary Act, such as the one that had just been passed, would do justice to the shareholders who had invested their money in the industry on the faith of its statutory position, or would rehabilitate gas undertakings in the eyes of the investing public. It was felt that, unless a more permanent form of relief was obtained, it would be quite impossible to raise additional capital in future, and that ultimately this would lead to the undermining of financial stability. This view was borne out by the statement made by Sir Albert Stanley, who said in the House of Commons during the Committee stage of the Statutory Undertakings (Temporary Increase of Charges) Bill on the 22nd of July, 1918:

> "The Committee did not suggest that such a rate of dividend would secure the necessary stability and attract money to the undertaking; and it was only purely as a temporary matter that the members of the Committee had made this particular recommendation. It was quite clear that, whatever relief was given to these undertakings, after the war it would be necessary for the Government to very seriously consider the whole situation."

Seriousness of the Position Increases.

Much thought was given to the question; and, at the end of June, 1919, a form of questionnaire was sent out to all members of the Council, in order to ascertain the financial position of their undertakings. From the returns which were received, it was quite clear that matters were very serious. On the 4th of July, 1919, a deputation of the gas industry waited on the President of the Board of Trade (Sir Auckland Geddes), and fully explained the position. The speaker on this occasion was Mr. D. Milne Watson, the President of the National Gas Council, supported by Sir Dugald Clerk, K.B.E., and Sir Arthur Duckham, K.C.B. It was pointed out to the President of the Board of Trade that, since the passing of the Statutory Undertakings (Temporary Increase of Charges) Act, the cost of raw materials and labour had still further increased; that the 150 million pounds invested in the industry had suffered depreciation to the extent of something like 50 millions; and that unless something was done to remedy this the industry would become practically bankrupt. Sir Auckland Geddes said it was absolutely certain that the future of the country was bound-up with the full utilization of the bye-products of the carbonization of coal, and that, ultimately, steps must be taken in some direction which would make it possible for the industry to carry on and to develop. The Board of Trade were fully alive to the importance of the industry and to the need for seeing that it was not pushed to the wall.

This deputation was followed by a general meeting of the National Gas Council on the 22nd of July, 1919; and the following Sub-Committee was appointed by the Central Executive Board to discuss the whole question: Mr. William Cash, Mr. R. W. Edwards, Mr. J. R. H. Jacobs, Mr. A. A. Johnston, Alderman F. S. Phillips, Mr. T. P. Ridley, and the President (Mr. D. Milne Watson). The following, at a later stage, were co-opted: Mr. J. Ferguson Bell, Mr. W. G. Bradshaw, Mr. F. J. Bradfield, Mr. Charles Hunt (since resigned), Mr. H. E. Ibbs, Mr. H. E. Jones, Mr. A. F. Phillips, Mr. Charles Wood, and Mr. C. E. C. Browne. The Sub-Committee held many meetings, and did a great deal of work in helping to collect the facts concerning the industry and to bring them before the Board of Trade.

Quality of Gas and the Conclusions of the Board of Fuel Research.

It should here be mentioned that, during the progress of the war, it had become necessary for the Board of Trade to impose restrictions as to the quality of the gas to be supplied by undertakings with a view to conserving the quantity of coal used, and to allow of washing the gas for benzole. Questions were continually being raised by local authorities and consumers as to the lower quality of the gas supplied, and out of this arose the further question as to what should be the most suitable gas to be made and distributed in future.

The Privy Council appointed a Committee, known as the Fuel Research Board, with Sir George Beilby as Chairman; and this Committee was asked by the Board of Trade and other departments concerned to advise as to "what is the most suitable composition and quality of gas and the maximum pressure at which it should be generally supplied, having regard to the desirability of economy in the use of coal, the adequate recovery of bye-products, and the purposes for which gas is now used."

The Committee issued a report, dated the 29th of January, 1919, but which was not published till the following April. A draft of the report, however, was submitted to representatives of the Council, the Institution of Gas Engineers, the British Commercial Gas Association, the Gas Companies' Protection Association, and the Society of British Gas Industries, for their comments in January, 1919; and the observations of the Council on behalf of the industry were duly communicated to the Board of Trade. The conclusions *inter alia* arrived at in the report were as follows:

- That it would not be to the ultimate advantage of any of the interests concerned that any one fixed standard of composition and calorific value should be prescribed. The prescription of a standard of composition in addition to the standard of calorific value would probably fetter the development of the supply of good and cheap gas.
- The consumer to be charged for the actual thermal units supplied in the gas.
- The gas undertaking to be free to deliver to the consumer any mixture of the ordinary combustible gases free from sulphuretted hydrogen and not containing more than 12 p.ct. of inert constituents.
- The gas undertaking to declare the calorific value of the gas it proposed to deliver, and to undertake to adjust consumers' appliances for the ordinary purposes of domestic lighting, heating, and cooking, in order that the gas delivered may be burned with safety and efficiency.
- Should the gas undertaking desire to change the calorific value of the gas, due notice to be given to the consumers or their representatives.
- The gas undertaking to supply gas at such a pressure that, under normal conditions of supply and equipment, there shall be a pressure of not less than 2 inches of water on the gas at the outlet of the consumer's meter.
- A suggestion was made that the more complete removal of the sulphur and cyanogen compounds should be kept well in view by all interests concerned.

Objections and Revision of the Recommendations.

The stipulation that gas should not contain more than 12 p.ct. of inert constituents, and that it should be supplied at a pressure

of not less than 2 inches, to be taken at the outlet of the consumer's meter, was received by the industry with the greatest anxiety.

The Council appointed a Sub-Committee—namely: Mr. A. E. Broadberry, Mr. W. E. Price, and the President (Mr. D. Milne Watson); and this Sub-Committee, together with representatives of the other Associations connected with the gas industry, carefully considered the position. Among the other members of the Committee were the following: Mr. Jacques Abady, Mr. Charles Bennett, Sir Dugald Clerk, Prof. J. W. Cobb, Mr. Cyril G. Davis, Mr. Samuel Glover, Mr. F. W. Goodenough, Mr. T. Goulden, Mr. T. Hardie, Mr. H. E. Jones, Dr. E. W. Smith, and Prof. A. Smithells.

The Council communicated with the Board of Trade on the 17th of April, 1919, enclosing a memorandum setting out the objections of the gas industry to the report of the Fuel Research Board. On the 16th of June, 1919, a conference on gas standards was held at the Board of Trade, when representatives of the Council were present. On the 20th of June, 1919, Sir George Beilby invited representatives of the gas industry to meet him at the offices of the Fuel Research Board. A further conference was held on the 28th of October, 1919, at the Fuel Research Board, with the result that the following agreement was arrived at:

(1) That the proposed system of charging the consumer for the potential thermal units supplied to him is accepted.

(2) That the thermal units chargeable are to be calculated by multiplying the number of cubic feet registered by the consumer's meter by the declared gross calorific value of the gas per cubic foot.

(3) That the calorific value of the gas is to be continuously measured and recorded by a recording calorimeter of a standard type to be passed by the London Gas Referees. That the method of installing, using, and checking the standard calorimeter is to be prescribed by the London Gas Referees.

(4) That, subject to the acceptance by the gas undertakings of the stipulations laid down in articles 1, 2, 3, 5, 6, and 7, the gas undertaking is to be free to deliver to the consumer any mixture of combustible gases free from sulphuretted hydrogen, and not containing more than 20 p.ct. of inert constituents for two years, 18 p.ct. of inert constituents for two years thereafter, and 15 p.ct. of inert constituents thereafter.

(5) The gas undertaking to declare the calorific value of the gas it intends to deliver, and to undertake to adjust, and if need be to replace gratis, the burners in consumers' appliances, with all reasonable speed, so that the gas delivered can be burned in these appliances with safety and efficiency.

(6) Should the gas undertaking desire at any time to change the calorific value of the gas supply, due notice to be given to the consumers or their representatives. During the period of notice, preparations to be made by the gas undertaking for any readjustment of the consumers' appliances which may be required, so that the gas then to be delivered can be burned in these appliances with safety and efficiency.

(7) The gas undertaking, within a period of five years, to supply gas at such pressure that, under normal conditions of supply and equipment, there shall be a pressure of not less than 20-10ths of an inch of water on the gas in any main or service pipe of 2 inches diameter and upwards.

(8) That the unit to be adopted in charging the consumer is to be 100,000 B.Th.U.

It will be seen from the above, therefore, that the Council obtained two great concessions for the industry:

(1) The limitation of inerts was increased from 12 to 20 p.ct. for the first two years, 18 p.ct. for two years thereafter, and 15 p.ct. after that period, and

(2) There was to be a pressure of not less than 20-10ths of an inch of water on the gas in any main or service pipe *of 2 inches diameter and upwards*, instead of a pressure of not less than 2 inches at the *outlet* of the consumer's meter, as originally proposed in the report of the Fuel Research Board.

It was explained that clause 53 of the report, with regard to the removal of sulphur and cyanogen compounds, was not in the nature of a recommendation to be imposed on the industry, but simply an expression of opinion by the Fuel Research Board.

Special mention should here be made of the valuable assistance rendered in connection with this matter by the Institution of Gas Engineers, Sir Dugald Clerk, Prof. J. W. Cobb, and Prof. Arthur Smithells.

The Bill Providing for the Heat-Unit Basis and Financial Revision.

About the same time, a letter was received from the Board of Trade, stating that careful consideration had been given to the representations made by the deputation from the National Gas Council in July; and that it was proposed to introduce a Bill in Parliament with as little delay as possible dealing with the gas industry, based largely upon the recommendations contained in the recent report of the Fuel Research Board, and that in connection with the alteration in the basis of charging for gas recommended in the report, the Board proposed to include in the Bill provisions for revising the existing standard and maximum prices of gas. They further stated that the Board had under consideration the introduction of a Bill to deal with certain difficulties in respect of the raising of capital required by public utility undertakings.

On receipt of this letter, a general meeting of the Council was held on the 29th of October, 1919, and discussion took place as to the course to be adopted by the industry. Finally, it was agreed that it would be in the best interests of the industry that companies should not deposit individual Bills dealing with the question of financial relief, but await the proposed Government Bill. This recommendation of the general meeting was acted upon by the industry with only one or two exceptions.

Discussions before Introduction.

The Bill, which was promised in the letter from the Board of Trade, was not, however, introduced before Christmas, as the industry had been led to expect; and, owing to pressure of other business, nothing was done during the early part of the new session of 1920. Many conferences, however, were in the meantime held by the Board of Trade with regard to the provisions of the promised Bill. These were attended by Sir George Beilby, the Gas Referees, representatives of the National Gas Council, the London County Council, municipalities not owning gas-works, railway companies, and the Sheffield Gas Consumers' Association. The outcome of these conferences was that the original proposals made by Sir George Beilby's Committee were modified to a very considerable extent in many important directions. Meanwhile, the long expected Bill was delayed, and the gas industry was becoming most impatient.

Matters came to a head when the trade unions connected with the industry demanded an extra 10s. a week advance in wages. This was the last straw; and the industry sent a letter to the National Federation of General Workers stating that they were unable to pay any further advance in wages, owing to their financial position.

Introduction of the Bill.

Shortly after this, the Government Bill was introduced. The main points were:

(1) An alteration in the system of charging, which was to be on a basis of thermal units, instead of by volume.

(2) The fixing of a new standard or maximum price which would take into consideration a company's unavoidable increases in the cost of production and supply since 1914.

(3) Powers authorizing the Board of Trade to grant Special Orders empowering amalgamations, purchase of supplies of gas in bulk, and the raising of capital, &c.

The Bill as deposited by no means satisfied the industry in its details, although (without divulging any secrets) it may be stated that at the conferences which had been held the original proposals had been very much modified and improved. At a meeting held on the 27th of May, 1920, the industry resolved, however, to welcome the Bill, and accept its general principles, with the reservation that every effort should be made to get the Bill amended in certain details during its passage through Parliament.

Proceedings in Parliament.

The Council had already arranged a scheme of propaganda throughout the industry, and the work was immediately put into operation. Trade Union representatives were approached, and

asked to secure the support of Labour members of Parliament—it being pointed out that if something were not done to help the industry, the employment of many men who looked to it for their livelihood would be endangered. In addition to this, a petition from the shareholders in gas companies was presented to the House of Commons, and meetings were arranged with various groups of Members of Parliament.

The outcome of these efforts was most satisfactory, in that a large number of Members of Parliament for the first time became acquainted with the difficulties of the gas industry; and, when the Bill came before the House of Commons for second reading on the 8th of June, 1920, there was practically no discussion, and but little hostile criticism.

Very arduous work devolved upon the National Gas Council in preparation for the Committee stage of the Bill—there being no fewer than ninety amendments set down on behalf of the industry. The points which were of the greatest importance, and upon which the Council were successful in obtaining amendments, were as follows.

The Bill, as drafted, being indefinite as to the point at which the minimum pressure should be measured, an amendment was put down to ensure that the pressure had reference to the *inlet* of the meter.

The railway companies had endeavoured, in both Houses, to obtain statutory sanction for an increased minimum pressure beyond 20-10ths of an inch in the event of the calorific value being less than 500 B.Th.U. They had also endeavoured to obtain the insertion of a clause giving railway companies the right to alter, adjust, or replace burners, pipes, and appliances as might be necessary in consequence of the declared calorific value of the gas being altered, and to charge the gas undertaking with the cost of such alteration, &c. The Council were successful in obtaining the rejection of these suggested amendments, and, in effect, established the principle that no one class of consumer was entitled to special or exceptional treatment at the cost of other consumers.

The Council, through the medium of the Federation of British Industries, met representatives of the Sheffield Gas Consumers' Association, and satisfied the Association that the interests of users of gas were amply covered by the Bill. The result was that all active opposition was withdrawn by the Association.

Clause 9, with regard to forfeitures in respect of deficient calorific value, was practically redrafted.

A clause was inserted in the Bill referring the question of inert constituents, together with the question of carbon monoxide in gas, to a special inquiry, which was to be held as soon as possible after the passing of the Act.

A Rapid Passage.

The Bill had a rapid passage through both Houses of Parliament, and finally received the Royal Assent on the 4th of August, 1920. Thus, in a period of a little over nine months from the general meeting of the Council at the Æolian Hall on the 29th of October, 1919, the decision of the industry not to promote individual Bills found its justification, and the Gas Regulation Act had been secured for the whole industry.

The Act a New Charter.

It is too early to say what the effect of this great new charter for the gas industry may lead to; but it can, without doubt, be said that it opens up a prospect of progress and development, the great possibilities of which cannot as yet be fully estimated.

THE ECONOMIC VALUE OF THE NEW ACT.

By Thomas Goulden, M.Inst.C.E., President of the Institution of Gas Engineers.

The year now commenced will stand-out as a conspicuous landmark in the history of the gas industry, owing to the coming into operation of the Gas Regulation Act, 1920, by which the method of charging the consumer will no longer be on the basis of volume, but on that of the thermal units supplied. It is true that discretionary powers rest with the Board of Trade in respect of the substitution of the basis of charge; but it is fairly well understood that the change is likely to be general.

Sale of Gas by Therms the Natural Outcome of the Calorific Value Standard.

The charge for gas at per 1000 c.ft., without reference to calorific value, has for several years been a curious anomaly—since, by reason of the practically universal use of the incandescent burner for providing illumination by gas, the heating power of the gas has long since become the essential factor of its value to the consumer. This fact was recognized in the Metropolitan area some years back, as evidenced by The Gas Light and Coke Company's Act, 1914 (to which the Royal Assent was given on the 7th of August of that year), the object of which was to relieve the Company of its obligations as to the illuminating power of gas, and to substitute therefor a standard of calorific value. In other words, the Company sought and obtained the obligation of supplying "British thermal units;" their charge for gas immediately subsequent to the coming into operation of the Act being at per 1000 c.ft. of gas of a calorific standard (nominally) of 540, but with a minimum of 499½ units; the actual candle value of the gas supplied usually approximating to the higher figure. The sale of British thermal units was thus, in fact, first statutorily recognized in the Metropolitan area; and the sale of gas by therms is the natural outcome of the experience gained under the provisions of the Act of 1914.

Developing Power of the Act—Gas Suitability and Distribution.

The Gas Regulation Act, however, gives much wider powers to gas undertakings than the mere sale of gas in terms of units of heat. The sanction given to choose the standard of calorific value should go far in extending the use of gas; since a gas undertaking will now manufacture the quality best suited to the special needs of the consumers in the particular area which it serves, and by the process which may be best adapted to make the most economical use of local conditions. Both the gas industry and the general body of consumers are much to be congratulated that the narrow, and indeed economically unworkable, margin of "inerts" first contemplated finds no definite place in the Act—thanks to Prof. Cobb's researches under the ægis of the Institution of Gas Engineers.

The principle of charge by the therm should effectually result in the supply of gas free from any undue proportion of inerts; while the absence of unnecessarily harassing regulations will favour economy in the use of raw materials otherwise difficult, if not impossible, of attainment. Moreover, the practical effect of the charge by therm will be to bring home to gas manufacturers who in the past may have been "unsound" on the point of "inerts," that the proper use of mains and other distributing plant is for carrying the maximum heat value that can be economically produced and distributed.

Manufacturing Research and the Problems.

There can be little doubt that a much-extended field of research into improved methods of manufacture will be laid open. The carbonization of coal in gas-works, for the production of heat units distributable to the community, already stands as an efficient process. There is ample scope for improvement, so far as the manufacture of gas in concerned. This is clearly seen in the report of Sir Dugald Clerk and Professors Smithells and Cobb to the Institution of Gas Engineers, in which, while the figure of gas production and distribution efficiency for the purpose of comparison was taken as 22·5 p.ct., the over-all efficiency of the carbonization of coal was stated as being 76·8 per cent. The problem of the industry is to so develop manufacture as to supply gas of a quality and calorific value most suitable to the needs of the public—simultaneously producing calorific value at the lowest possible cost per therm consistent with realizing the maximum thermal potential present in the raw material used. At the same time, beyond the single question of gas manufacture, the needs of the country in respect of the production of tar and ammonia must be regarded. The problem is more complex than appears at first sight; but I am confident that the full exchange of ideas and experience between the increasing number of scientific investigators and engineers in charge of actual manufacturing operations, will ultimately solve it.

What will be the Ultimate Solution?

What method of carbonization may eventually prove best adapted to the end we have in view, I am not bold enough to forecast. It is clear, however, that a greater or less proportion of the coke now realized as a residual product must be gasified simultaneously with the carbonization of the coal from which it originated. The heat expended in the process of carbonization bears a serious proportion to the heat potential of the coal

carbonized; and it is difficult to perceive how this loss can be substantially reduced, so long as the temperature of the coal in the retorts is raised solely by external firing.

I look forward with considerable anticipation to the early development of some modified form of gas production, in which the heat necessary for the carbonization of the charge will be mainly produced within the retort. The successful operation of a plant of this type will, I believe, prove the ultimate solution of the carbonization problem.

PERSONAL.

PRESENTATION TO MR. JAMES DUNNACHIE.

In the Glenboig Institute, last Wednesday evening, Mr. James Dunnachie, J.P., the Chairman and Managing-Director of the Glenboig Union Fire-Clay Company, Ltd., was presented with a testimonial by the Company's employees and friends, on the occasion of his completion of sixty years' work in Glenboig. Mr. John Douglas (Works Manager) occupied the chair, and said that, alike on account of his long and prominent connection with the district, his position in Glasgow business circles, and his personal eminence in the county generally, Mr. Dunnachie was well worthy, after sixty years, of the place of honour he occupied in the Company and in the hearts of his immediate friends and neighbours. Without making the claim—for a variety of reasons—they were told by different people, both locally and beyond their borders, that they in Glenboig were the leaders in the fire-clay trade. For many years they had had visitors to see the works from all over the world; and they all told them that the Glenboig brands had the reputation of being the best, and the best known, of any fire-brick in the world's markets. Immediately associated with the brick and its reputation for the long period of sixty years, was the name of Mr. Dunnachie; so it was only the modest truth to state that, even among the many well known men in the fire-brick trade, their friend stood out by himself. The presentation took the form of an illuminated address and a musical cabinet, together with a silver tea and coffee set for Mrs. Dunnachie. When Mr. Dunnachie rose to reply, looking in the best of health, the cheering was loud and prolonged. He remarked that wherever metals were smelted, Glenboig bricks were used to confine the high temperatures required for the purpose. At the various international and other exhibitions, Glenboig had never failed to secure the highest award given for fire-bricks.

Even the best of friends sometimes unintentionally mislead. Lord Fairfax of Cameron, at the recent meeting of the Imperial Continental Gas Association, referred to the approaching retirement of Mr. ROBERT W. WILSON from the Secretaryship [see p. 773 last week], and Mr. E. Sebag Montefiore referred to the subject. The Chairman did not say anything in the nature of a denial. We now learn that the statement was premature. It is true that Mr. Wilson is closely approaching the age limit of 65 fixed by the Association's pension scheme; but, in the exercise of their discretion, the Board have requested him to continue to fulfil the duties of Secretary until such time as they feel they can better dispense with his services. To this request, Mr. Wilson has gladly agreed. Among the proprietors there will be the greatest satisfaction.

Mr. P. J. CHANNON, son of the late Manager of the Haywards Heath Gas-Works, has been awarded the O.B.E. for special work on poison gas, &c.

Among the New Year's Honours were five peerages, one of which has been conferred upon the Right Hon. Sir HORACE BROOKS MARSHALL, K.C.V.O., who is a Director of the Commercial Gas Company, and was Lord Mayor of London in 1918-19. Mr. A. E. BOWEN, the Chairman of the Primitiva Gas Company of Buenos Ayres, is made a baronet, in recognition of public services on many Government War Committees. Mr. A. R. DUNCAN, Coal Controller since October, 1919, has had conferred upon him the honour of knighthood.

OBITUARY.

It was with much regret that a letter was received earlier this week from Mr. John Young, of Hull, in which, writing from Pittsburgh, he announced the death, on Dec. 13, of his father, Mr. JOHN YOUNG, SEN. The deceased gentleman had had a long career as a gas engineer, as he began in Grangemouth in 1857, went to Falkirk in 1862, Hawick in 1863, Stoke in 1869, Hull in 1872, and Sheffield in 1874. He removed to the United States in 1876, and built a chemical works there. Mr. Young was one of the pioneers of the natural gas industry, and retired from active business about fifteen years ago, though he always retained a keen interest in all gas matters.

At the moment of going to press with this issue of the "JOURNAL," we were very sorry to have news of the death of Mr. ALFRED THOMAS HARRIS, of Market Harborough, which occurred last Sunday night. Deceased, who was in his 58th year, had been ill for nearly twelve months, but had kept about until two or three weeks ago, and was able to attend to business almost up to the very last. He leaves a widow and two sons. The late Mr. Harris was a native of Droitwich; and for the last 21 years he had been Manager and Secretary of the Market Harborough Urban District Council Gas-Works. He was President of the Midland Association of Gas Engineers in 1919, and will be much missed at the meetings of the Association, in which he always took a great interest.

The death is to be recorded of Mr. WILLIAM FAIRWEATHER, Joint Engineer and Manager of the Kilmarnock Gas-Works. A personal friend [D. R.] sends the following "Appreciation" of the deceased: "Among the many blanks which death has caused in the ranks of the gas profession in these days, few have been more regretted than the passing-over to the great majority of William Fairweather, of Kilmarnock. A man of sterling character and acute perceptive power, our friend was withal an active influence for good in the West of Scotland, where his professional life was spent. Many men who now occupy responsible positions in the gas industry can ascribe their first and further successes in life to the kindly help and wise advice given by our departed friend out of his goodness of heart and mind, which seemed inexhaustible. William Fairweather did not seek publicity either in professional or social circles, yet few men succeeded as he did in evoking such feelings of love and respect in the hearts of his fellows. He lived his life, which was full of years; and he has now passed away amid the sorrow and regrets of a peculiarly wide circle of devoted friends. Verily, many there be who revere his memory and will call him blessed." The deceased gentleman was a native of Kirriemuir, and held appointments at Dundoon and Barrhead before going to Kilmarnock in 1886. His son, Mr. Charles Fairweather, was Joint Engineer and Manager.

FEDERATION OF GAS EMPLOYERS.

Second Annual Meeting.

THE Second Annual General Meeting of the Federation of Gas Employers was held on the 15th ult., at the Æolian Hall, New Bond Street, W.

The Chairman (Mr. D. Milne Watson), in giving a brief *résumé* of the activities of the Federation during the year, stated, among other things, that some 600 individual claims and questions in dispute had been dealt with by the Federation, and had been, in every case, settled satisfactorily to the gas undertaking concerned, or else withdrawn altogether.

Mr. Thomas Hardie (Newcastle-on-Tyne) moved the adoption of the report, which was seconded by Alderman F. S. Phillips (Salford), and adopted.

Mr. D. Milne Watson was unanimously re-elected Chairman for the ensuing year.

Mr. Hardie stated that he would be unable to continue his duties as Vice-Chairman on account of his having severed his connection with the Newcastle-on-Tyne and Gateshead Gas Company. Mr. Samuel Tagg and Alderman A. Ball were thereupon unanimously elected Vice-Chairmen for the ensuing year.

Coke-Oven Gas for Town Supply.

Birmingham (Ala.) is the twelfth American city to rely wholly or in part upon gas furnished by Semet-Solvay coke-ovens. The local Light and Power Company, finding themselves overtaxed in meeting the requirements of the rapidly growing city, arranged for a supply of 2½ million c.ft. per day (to be increased in the near future to about 7 million c.ft. per day) of surplus gas from the bye-product plant of the Sloss-Sheffield Steel and Iron Company, which consists of 120 Semet-Solvay standard regenerator ovens. Regulations are being adopted which will reduce the required calorific value of the gas from 575 to about 525 B.Th.U. The coke-ovens have a capacity of approximately 16 tons per charge. They are lined throughout with silica brick, and covered with some 3 ft. of brickwork. Incorporated in the oven structure is the Semet-Solvay division wall, which makes each oven a distinct unit for heating or repairs. Reversals are effected by a simple automatic damper mechanism at the end of each block; and the waste gases pass into two 200-ft. Rust Engineering Company's stacks, one at each end. The extreme simplicity of this reversing device is one of the outstanding features of the ovens; it being necessary to reverse the air only—the gas flow remaining constant. Heat recovery is said to be so complete that less than 40 p.ct. of the total gas obtained from the coal is needed for heating the ovens. Though accurate figures of gas production and consumption for this plant are not yet available, experience with similar Semet-Solvay installations indicates a surplus gas yield of over 6000 c.ft. per ton of dry coal charged. In connection with the coke-quenching section of the plant, hot water is recovered from the breeze sump and used again for quenching—it having been demonstrated that a smaller quantity of hot water is required for quenching a car of coke than when cold water is employed. As a matter of fact, one of the most serious problems encountered in designing this bye-product plant was the scarcity of water. Experience has shown that operation at a high rate of speed with these ovens does not interfere with the yield of bye-products—probably, it is thought, because the temperatures in the various parts of the ovens are so easily controlled.

GAS BILLS FOR 1921.

[FIRST ARTICLE.]

A BEGINNING is made to-day with the new session's parliamentary work, by reviewing the Bills which have been lodged in Parliament, and which deal wholly or in part with gas affairs. They will be noticed in alphabetical order.

The first one to be dealt with is the "Omnibus" Bill of the BATLEY CORPORATION, Part IV. of which comprises gas matters. The clauses are mostly in the ordinary form. The first one confers power to supply gas-fittings, followed by authorization to enter premises and remove fittings. Several provisions customary in all modern legislation succeed. In these days, a useful one is that under which the Corporation may specify the size and material of the pipes, with the fittings, which are to be laid by the consumer on his own premises, either in the first instance, or on the occasion of any renewal. The Corporation may, if they think fit, make different specifications for different classes of premises, having regard to the probable maximum consumption of gas therein at one time. Inspection is provided for. Bulk supplies to other districts are contemplated, as well as the purchase of gas in a crude or partially purified state. Authorization to supply power gas is also asked for. Sanction is sought to the provision and maintenance of houses and buildings for persons in the employ of the Gas Department, as well as offices, showrooms, and other premises. In the electricity section, we see power is required to increase by 50 p.ct. the maximum prices specified in the Provisional Order of 1898. Among the borrowing powers is £100,000 for the general purposes of the gas undertaking, with a period of repayment of forty years. There are clauses regulating the retail sale of coke by weight. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

In a Bill of considerable scope, the BURNLEY CORPORATION have, in the miscellaneous section, a clause to empower them to purchase or take on lease offices, showrooms, and other buildings for the purposes of the gas undertaking, and to erect, fit up, maintain, and let any such buildings upon any lands for the time being belonging to, or leased by, the Corporation. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The Bill of the CARDIFF GAS COMPANY is one of the promotions for the coming session which has outstanding interest. Before dealing with the clauses, some information may be extracted from the preamble. The issued capital now consists of £501,860 consolidated ordinary stock, entitled to a maximum dividend of 5 per cent. per annum, and £96,410 preference stock, entitled to a preferential dividend of 4½ p.ct. The premiums amount to £33,625. There remains to be issued £227,277. There have been created and issued 5 p.ct. perpetual debenture stock to the amount of £51,000, and 4 p.ct. debenture stock to the amount of £20,000, with premiums to the small sum of £119. The balance of borrowing powers is £80,000. The Company have been compelled to borrow from their bankers and other sources, and now owe, large sums of money, which are being increased from time to time. Before recourse was had to the Statutory Undertakings (Temporary Increase of Charges) Act, the maximum prices for gas were: Within the city and Penarth, 3s.; in the rural district of Llandaff and Dinas Powis (except Pentyrch), 3s. 3d., with a proviso that the price in the rural district should not at any time be more than 3d. above the price for the time being charged to ordinary consumers in the city; and within the rest of the limits of supply (including Pentyrch), the maximum price is 4s. Under the Temporary Increase of Charges Act, the maximum prices were increased to 5s. 6d. in the city and Penarth, 5s. 9d. in the rural district of Llandaff and Dinas Powis, and 6s. 6d. in the rest of the limits of supply, including Pentyrch. Under the same Act, the maximum dividend is now only 3¾ p.ct. The case is put for raising additional capital, as well as for placing the dividend on existing ordinary stock on a proper basis. Having mentioned the establishment of a co-partnership scheme in 1909, the Company submit that the consumers, employees, and shareholders should be brought into closer alliance than hitherto. There is a reference to the Gas Regulation Act, and mention is made of the public lighting agreement of Dec. 17, 1907, by which it was provided that the price of gas for public lighting should not exceed either 2s. 2d. or 7d. less than the price for the time being charged to the general or private consumers, whichever price should be the lower. The Company are consequently compelled to supply gas for public lighting at considerably below the actual cost of manufacture; and they seek to amend the agreement. Turning to the clauses, the first of interest are those dealing with the establishing of the heat-unit basis. It is provided that, within six months from the passing of the Act, the Company shall declare the calorific value of the gas; and provision is made for varying it through the Board of Trade by complying with the necessary formalities. Provision is made for the altering, adjusting, or replacing (at the expense of the Company) of burners in consumers' appliances, from time to time, in such manner as to secure that the gas of the declared calorific value can be burned with safety and efficiency. The provisions of the Gas Regulation Act as to composition and pressure of gas, testing of gas, forfeitures, and penalties are to apply to the Company, provided that they "shall not be under the obligation to supply gas at the minimum permissible pressure defined in sub-section (4) of section 2 of the said Act until a date to be fixed by the Board of Trade by Order under section 1 of the Act, and such Order may prescribe different minima of pressure for different parts of the limits of supply." From the first quarter-day after the passing of the Act, it is proposed that the basic prices of gas supplied to ordinary consumers shall be: Within the city and the urban district of Penarth, 1s. 7d. for each standard unit; within the rural district of Llandaff and Dinas Powis, 1s. 7·7d.; and within the remainder of the limits of supply (including Pentyrch, Michaelstone-super-Ely, Caerau, and Michaelstone-le-Pit), 1s. 9·8d. Section 35 of the Company's Act of 1906 is to be amended so that the rents and charges for fittings mentioned in the proviso to sub-section 1 shall be 1s. 3½d. per standard unit. The charge for public lighting in the city and Penarth, it is asked, "shall not exceed 1½d. per standard unit less than the price charged by the Company to ordinary consumers for gas supplied for lighting purposes only." The proposals as to basic rates of dividend are 6 p.ct. on the ordinary capital issued before the passing of the Act, and 8 p.ct. on the ordinary capital issued after the passing of the Act. As to participation in the benefits resulting from good working, the following clause appears:

> If in any year or half year, the selling price or prices of gas shall have been below the basic price or prices, such reduction shall for the purposes of this section be attributable to good working, and the effective co-operation of the employees of the Company, and the holders of ordinary stock and the employee co-partners of the Company shall, subject as hereinafter provided, and if and so far as in the opinion of the Directors the amount standing to the credit of the net revenue account after providing for dividend on the preference stock (if any) and dividends at the basic rates permits, be entitled to receive in the manner hereinafter mentioned in equal shares a sum equal in the whole to one-half of the total sum by which consumers have benefited in such year or half year by way of a reduction in the price or prices of gas supplied to them below the basic price or prices, and the following provisions shall apply thereto (that is to say):
>
> (1) Any sum so to be applied for the benefit of the holders of the ordinary capital may be applied in the increase of the dividends above the basic rates, and if, and so far as, not so applied shall be carried to the reserve fund;
>
> (2) The sum so to be applied for the benefit of the employee co-partners of the Company shall be carried to the co-partnership fund. The moneys so carried to the co-partnership fund shall be allocated by way of a uniform percentage of bonus on the salaries and wages of the employee co-partners of the Company.

Additional capital powers are sought to the amount of £300,000. Borrowing powers are desired (in addition to the £71,000 already borrowed) to the amount of £300,000, and any sums not exceeding in the whole half the amount of any capital not authorized by the present measure. Debenture stock and redeemable preference or debenture stock are provided for. Reserve and special purposes funds powers are included. Extension of the limits of supply are desired, as well as authorization to acquire certain lands compulsorily or by agreement. Manufacturing and storage powers on lands described are also required. The authorization in the Company's Act of 1906 as to the supply of gas in bulk is to be repealed, and new sanction is asked for to contract with any local authority, company, or persons authorized to supply gas under parliamentary powers in any district adjacent to the Company's limits for the supply of gas in bulk for periods not exceeding in any case seven years. Provision is made for superannuation and other allowances. [*Parliamentary Agents: Messrs. R. W. Cooper & Sons.*]

The COLNE CORPORATION in their Bill deal with the heat-unit basis with notable brevity: "The price to be charged by the Corporation for gas supplied by them to persons who shall burn the same by ordinary meter shall not at any time exceed the sum of 1s. 4d. per therm, or such other sum as may from to time be sanctioned by the Board of Trade." Persons who have an independent supply of gas or of electricity are not to be entitled to demand a supply of gas from the Corporation unless they agree to pay such a minimum annual sum as will give a reasonable return on the capital expenditure, and cover other outstanding charges incurred by the Corporation in order to meet the possible maximum demand. The maximum charge for the hire of prepayment meter and fittings is to be 4d. per therm, and if a cooking-stove is included 6d. per therm. The maximum charge for a prepayment meter without fittings is put at the rate of 3d. per therm, or 10 p.ct. on cost, whichever is the higher. The minimum pressure of gas is placed at 15-10ths. The testing for calorific power, it is proposed, shall be as prescribed by the Metropolitan Gas Referees; and it is provided that the "standard" calorific power shall be 450 B.Th.U. Penalties for deficiencies are prescribed, unless produced by circumstances beyond the control of the Corporation. [*Parliamentary Agents: Messrs. Baker & Son.*]

The HARROGATE GAS COMPANY are in the next Bill adopting the heat-unit basis; and, as in the Cardiff Bill, the principles of the precedent set by the South Metropolitan Act of last session are seen. First, in the preamble to the Bill, it is stated that the issued capital is comprised of: "A" stock, £13,333; "B" stock, £27,000; "C" stock, £30,770; and 4 p.ct. preference stock, £35,840. Premiums amount in the aggregate to upwards of £46,000. The Company are at present under the sliding-scale; and the standard rates of dividend on the "A," "B," and "C" stocks are respectively 10, 7½, and 7 p.ct., with a standard price of 5s. 6d. per 1000 c.ft. In 1914 the price charged was 2s. 6d. per 1000 c.ft., at which price the authorized rates of dividend on the three classes of stock were respectively 19, 16½, and 16 p.ct. per annum. The price of gas has had to be increased to 4s. 2d., at

which price the authorized rates of dividend on the three classes of stock are respectively less by 5 p.ct. per annum than the authorized rates just mentioned. For a period of thirty years before the war, the various issues of "C" stock (which was the only stock issued during the period) were made at prices which represented on the average a return to the investor, on the basis of the authorized dividend for the time being, of less than 5¼ p.ct. per annum. Under existing conditions the Company could only issue ordinary stock at a price which would mean a much higher percentage of return, and on the basis of a substantially reduced authorized rate of dividend. Then follows a reference to the substitution for the sliding-scale of the plan by which, after providing a reasonable return on the capital, any divisible profits should be applied in greater part to a reduction of the price of gas, and the balance partly in increasing the return on the capital, and partly by way of bonus to the employee co-partners. Consolidation of the three classes of stock is also part of the legislative plans. There are, it also appears, sums which the Company might have transferred to the reserve and special purposes funds; and so the promoters submit the expediency of being empowered to carry from the net revenue account £2298 10s. to the reserve fund, and £5228 to the special purposes fund. Turning to the clauses. In the first place it is proposed to consolidate the "A," "B," and "C" stocks into £112,005 of ordinary stock. This sum will be divided in the following proportions: To the holders of "A" stock, £1 16s. of consolidated stock for each £1 of stock held by them respectively; to holders of "B" stock, £1 11s. of consolidated stock for each £1 of stock; to holders of "C" stock, £1 10s. of consolidated stock for each £1 of stock. All resolutions creating or authorizing the issue of "C" stock are to be annulled so far as any remains unissued on Jan. 1, 1922. The Company ask authority to raise by the creation and issue of additional amounts of consolidated stock or of new preference shares or stock any moneys authorized by the Order of 1897 to be raised by the issue of new ordinary shares or stock or new preference shares or stock, but not so raised before the prescribed date. As to additional capital, the Company seek to be empowered to raise £200,000 by the issue of further amounts of consolidated stock and of new preference shares or stock. Borrowing powers are desired on the one-third scale. The debenture stock provision follows, and then the transfers to the special purposes fund and existing reserve fund (as already noted) are provided for. At Jan. 1 next, the amount standing to the credit of the existing reserve fund, after payment therefrom of any sums required to make up to the respective authorized rates the dividend on the "A," "B," and "C" stocks up to Dec. 31, is to be carried to the new reserve fund. The heat-unit clauses follow. In connection with these, it is provided that the gas shall not contain any trace of sulphuretted hydrogen, and shall be supplied at such pressure in any main or in any main laid between the main and the meter and having an internal diameter of 2 in. and upwards, so to balance a column of water not less than (*a*) in the case of gas supplied to any premises situate at a lower level than 200 ft. above Ordnance Datum, 1½ in. in height; and (*b*) in the case of gas supplied to any premises situate at any higher level, 2 in. in height. This is not to apply to power gas for industrial purposes only. The testing of gas is to be under the powers conferred on the Gas Referees. Appeals to the Chief Gas Examiner are provided for, as well as contributions to the gas fund. But there is a clause which stipulates that, "except by this Act expressly provided, the provisions of sections 1 to 9 of the Act of 1920 shall not apply to the Company or their undertaking." Within six months of the passing of the Act, the Company are to declare the calorific value of the gas to be supplied by them. Provision is made for altering, through the Board of Trade, the declared value; and a section deals with the adjustment of consumers' appliances. The proposed basic price of gas is 11·2d. per therm. It is next proposed that the Company shall not in any one year declare any larger dividend on the consolidated stock than 10 p.ct.; and this is to be referred to as the "authorized rate." If the balance to the credit of the net revenue account (after paying the dividends) permits, there is to be applied in two equal parts, for the benefit of the holders of consolidated stock and of the employee co-partners, a sum not exceeding one-third of the amount by which the total amount actually payable by the consumers of gas is less than the amount which would have been payable if the gas had been charged for at the basic price. The stockholders' share may be applied to increasing the dividend above the authorized rate; and if, and so far as, not so applied, it is to be carried to the reserve fund. The employee co-partners' share will be carried to a co-partnership fund, and is to be allocated by way of a uniform percentage of bonus on the salaries and wages of the co-partners. If the Chief Gas Examiner certifies that in any year the testing of the gas has shown it to contain on an average less than one part by volume of carbon bisulphide vapour per 40,000 volumes of gas, then there shall be taken into calculation for the purposes of the section dealing with the division of surplus profits, in lieu of the sum actually payable by the consumers, the sum which would have been so payable if the price charged for gas had been less by ¼d. per therm than the price actually charged. Provision is made for the revision, if necessary, of the basic price. The maximum charges for the hire of a prepayment meter and fittings and of a prepayment meter without fittings are to be at the rates of 2d. and 1d. respectively for each therm supplied, or in either case at the rate of 10 p.ct. on the cost of the meter and fittings (if any), whichever shall be the higher. The next clauses deal with a profit-sharing and saving scheme. An amendment of the Company's obligations to furnish supplies of gas are interesting. The clause is as follows:

Section 66 [Company to Supply Gas in Certain Events at Request of Owner or Occupier] of the Act of 1863, and section 39 [Amending Section 66 of Act of 1863] of the Act of 1909, are hereby repealed, and in lieu thereof the following provisions shall have effect (that is to say):

(1) The Company shall at the request in writing of the owner or occupier of any premises situate within 50 yards from any main of the Company give and continue to give a supply of gas for such premises; and they shall provide and fix or lay a meter and any main or extension of main and any service-pipe that may be necessary for such purpose, subject to the conditions following:

Every owner or occupier requiring a supply of gas shall serve a notice on the Company at their office specifying the premises in respect of which such supply is required, and the day (not being an earlier day than a reasonable time after the date of the service of such notice) upon which such supply is required to commence, and shall (at the option of the Company) either—

(*a*) Repay to the Company the cost incurred by them in providing, fixing, and laying such meter and main or extension of main and service-pipe as aforesaid; or

(*b*) Enter into a written contract with the Company (if required by them so to do) to continue to receive and pay for a supply of gas for a period of at least five years, of such an amount that the rent payable for the same shall not be less than 30 p.ct. per annum on the outlay incurred by the Company in providing and fixing and laying such meter and main, or extension of main and service-pipe as aforesaid.

And in either case give to the Company (if required by them so to do) security for the payment to them of all moneys which may become due to them by such owner or occupier in respect of any such meter, main, extension of main, or service-pipe provided and fixed or laid by the Company, and in respect of gas to be supplied by them.

(2) Notwithstanding anything contained in this section, it shall be lawful for the Company, in any case in which they may think fit so to do, to provide at their own expense any such meter as aforesaid, and the whole or any part of any such pipe as aforesaid.

(3) Section 11 of the Gas-Works Clauses Act, 1871, shall not apply to the Company.

Annual meetings are arranged for; and power is to be taken for the Directors to determine the remuneration of the Secretary and Auditors. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

ELECTRICITY SUPPLY MEMORANDA.

THIS will be a year fruitful of interest for the electricity supply industry. Whether it will do much that is substantial towards bringing about those big developments that are hoped for, if not anticipated with some amount of ill-ease, is a matter that time only can truthfully answer, for it is useless in these days to indulge in anything in the nature of a speculative forecast. As will have been seen from the information given in the "Memoranda" last week from the speech of Sir John Snell, at the Electrical Development Association luncheon, the Electricity Commissioners were last year particularly busy in two directions—in defining the areas for the Joint Electricity Authorities, and in granting loans for large power stations (which it is hoped will fit in with the ultimate schemes), and in empowering the spending of goodly sums on the extension of existing electricity supply stations. Costly money, materials, and labour will cause the product of this expenditure to represent only about one-third of the capacity that the same outlay would have provided before the war. Capital charges on the work will therefore be relatively heavy, despite higher efficiency. Next Tuesday the Commissioners will open their work of investigation into the new electrical areas and schemes by holding an inquiry at Bristol into the West of England proposals. Inquiries will follow in other places respecting other areas and joint authorities. From three out of the thirteen districts provisionally determined by the Commissioners, schemes have been received; and schemes from the other districts must all be lodged before April 30. Additional interest will be found in the new Electricity Bill, which is to enable the joint authorities to finance themselves without State aid. Meanwhile, lighting current charges in many places are bordering on, or have already reached, 1s. per unit. Installation costs continue to be the cause of much heartburning; and electrical appliances find the prices on their tags only attract the new rich. Hence the bringing into application of the hiring powers conferred by the Electricity Supply Act of 1919. Therefore, altogether the electrical doings of this year will be extremely interesting, though the obstacles in the path of development will compel, so far as judgment can discern, progress to be at a somewhat slow rate.

Interest Ahead.

The New Bill.

Welcome has been given to the new Government Bill by those who look upon it as a necessary rounding-off of the Act of 1919. It is all that. The joint authorities could not get along without financial powers. But there are the electrical pessimists who regard parliamentary authority to raise money as one thing, and actually raising it and getting it in hand as another. These pessimists will not do the electricity industry much good in the

eyes of the investing public. Money can be got if the interest is sufficiently attractive, and the security good. The industry must decide for itself whether the much-advertised superlative qualities of their commodity will enable them to pay a good rate of interest and offer sufficient security. If not, then there is something amiss with their professions respecting virtues, and the place that electrical operation is expected to hold in the development of the conveniences of the community and the industrial prosperity of the country. However, the Bill confers borrowing powers upon the new joint authorities, so that they may purchase generating stations or main transmission lines, or may build on their own account. Repayment will be spread over a term of years, and will include the interest paid while the expenditure remains unremunerative. This may be a long-winded business. Working capital will also be included for the first three years after the establishment of the joint authority. Local prudence will not be so satisfied with the clause which empowers local authorities in an area to lend money to the joint authority, to subscribe for the authority's securities, to guarantee or assist to guarantee the payment of interest on the authority's loans, and to give financial assistance in any other form, subject (except in the case of the London County Council) to the consent of the Ministry of Health. The expenses of the Commissioners are to be apportioned among the joint authorities and the other authorized undertakings in accordance with the number of units generated during the twelve months ending on Dec. 31. There is a little whipping-up power conferred upon the Commissioners. They may require the authorized undertakers to give such reasonable facilities for the supply of electricity within their area of supply as may be specified in an Order, including the provision of new works; and if the undertakers are unable or unwilling to comply with the Order, the Minister of Transport may either order that the undertaking of the authorized undertakers or part of it shall be transferred to the joint authority, or confer on the latter power to supply electricity within the area of supply of the authorized undertakers. There are a number of miscellaneous clauses. One of them deals with the limitation of charges, so that consumers may benefit by any reduction in the cost of generation and supply. There would be no immediate worry over this particular power. It is also to be enacted that three instead of five years shall be the period for the revision of maximum prices. The prices fixed for current supplied by the joint authorities are to be sufficient to cover expenditure, including interest and sinking-fund charges.

Heating of Buried Cables.

We are unfeignedly glad that the British Electrical and Allied Industries Research Association have taken up the question of the heating of buried cables; and it is hoped that one result of this will be to find the conditions that will promote greater security by defining exactly what can be done in regard to temperatures, and the cable conditions which offer the most resistance to the generation of unpleasant trouble. Our pleasure over the matter being under serious investigation is due to the fact that the gas industry has so often been the victim of a proper want of knowledge of it. Time was when every street explosion was attributed to the escape of gas from the local distributing system, the formation of an explosive mixture, and then a "short" or something else in the electric system completed the conditions for mischief. Gas was blamed; and gas had sometimes to pay. After awhile it was discovered that a particularly explosive gas was generated by bitumen covered cables that became overheated, and that the guilt for certain uncomfortable incidents in town life was wholly attributable to this fact. It is not because of the interest taken in the matter by the gas industry that the Research Association with the ponderous name are at work; but their labours should bring relief for the industry from unmerited blame. A preliminary report by the Association has been published in the "Journal of the Institution of Electrical Engineers;" and it was discussed at a meeting of the members. It has not got far towards definiteness; but it shows work well in hand. It is hoped by electrical men that one result of the inquiry will be the ability to increase the maximum safe temperature at which cables can work, as this would be an economic advantage. But there will have to be care in regard to bitumen covered cables if what has happened in the past is not beneath notice. What should be determined is the critical temperature at which danger occurs. However, one conclusion the research so far points to as being almost definite is that armoured cable laid in earth has a superiority over cable laid in duct. For one reason it will carry something like 25 p.ct. more current than a cable drawn into duct. But with armoured cable the cost of trench work is a disadvantage. On the other hand, with the duct system it is necessary to put in more copper to do the same amount of work. However, we shall hope to hear more of this investigation into the heating of cables, because the gas industry is interested in having trouble from over-heating put upon the right shoulders, while not desiring to shirk its own responsibilities.

Bulk Supply Contracts and Cost Increases.

There has been an interesting case before Mr. Justice Lawrence, in the Chancery Division, with reference to a series of agreements entered into before the war (in fact, the last is dated 1911) between the North Metropolitan Electric Power Supply Company and the Borough Council of Stoke Newington, for the supply of energy to the latter. The date of the last contract shows that between then and now there is a great gulf so far as producing costs and trading conditions are concerned. Everything has mounted up in price or changed for the worse. The "Electrical Review," commenting on the case, tells its readers that "electrical energy is a commodity which is costly to produce; that production has been rendered more expensive by rises in the price of coal and large increases in wages; and that electric supply companies are not philanthropic institutions." This iteration of known facts applies to the North Metropolitan Electric Supply Company equally with other undertakings. So the Company, not being able to get the agreements revised to their liking, sought to have them annulled; and very properly they have been successful. They have been making a heavy loss on the agreements; and they therefore submitted that their enforcement would be a serious hardship on them. They attributed the heavy annual loss to the rises in coal and wages; and they contended that this constituted an alteration in trading conditions within the meaning of section 1 (subsection 1) of the Courts Emergency Powers Act, 1919. It was an easily deposed submission that was made by the Borough Council, that coal and wages had risen since the war, and so in considerable part had not occurred during the war. The prices have continued on the up-grade. And why? Largely because the purchasing power of money has fallen owing to the war; and this is the main cause for the demand for higher wages and higher prices. On all points his Lordship was with the Company. The agreements were annulled; but the Council are still entitled to demand, and the Company are bound to give, a sufficient supply at a price to be fixed. The Council are now pondering over the question whether it would not have been better to have acted equitably, and not to have tried to keep the Company bound to something which occasioned an unavoidable loss due to the war. At the same time, they are considering whether or not they shall appeal, or be content with Mr. Justice Lawrence's decision, and let equity prevail.

Electrically Heated Boilers.

In an article on this subject, the "Electrical Times" says to get some idea of the cost of working an installation, it may be assumed that the following quantities of electricity are required in order to give the same heating effect as 1 lb. of average quality coal: In small boilers, 1·5 KW.-hours; in large central heating installations and similar plants, 2 KW.-hours; in large heating plants for industrial purposes and in high-pressure steam-boilers, 2½ KW.-hours. Our contemporary has omitted to calculate-out the comparative costs at to-day's prices, in order to complete the tale.

Benches of Sixteen Horizontal Retorts.

Mr. R. G. Porter, in an American Gas Association paper described a new retort-house put into work for the Philadelphia Suburban Gas and Electric Company. He pointed out that Mr. A. W. Warner, of the American Gas Company, who was primarily responsible for the design of the installation, was limited by certain restrictions; his problem being to utilize available coal and coke handling equipment with the least possible changes to the building proper. The charging machines having been built for benches with eight tiers of retorts, the natural result was benches of sixteen retorts. The benches may be said to be of the "lintel" type of construction rather than of the "arch" type. The only arches used are those forming the base for the retorts and settings just above the recuperation and the so-called combustion chamber. No arches are used at the top of the bench—merely a cover of silica material, with sufficient insulation. No division walls are used; there being instead a continuous set of 4-in. baffle tiles, which permit an extremely close connection from the mouthpieces to the hollow buckstays which serve as gas off-takes. The retort-sections are tongued and grooved, with the exception of the bottom blocks. The sections forming the bottom corners of the retort have projections 2 in. thick at each end, which serve as a part of the setting proper. This feature has a direct bearing on the strength of the retorts; and as they are laid up tight, with expansion taking place from the centre of the retort outwards, with even this unusual height of setting, tight, strong, true retorts under heat have resulted. Any wear on the bottoms of the retorts from the scoop of the charger is provided for by having removable bottom blocks, which may be replaced while the bench is under heat. These removable bottom blocks are said to add from 60 to 70 p.ct. to the life of horizontals before re-setting. The fact that the retorts are laid up tight, without any allowance for expansion, necessitates leaving expansion spaces between the setting blocks, and also at the arches above the recuperation and combustion chamber. In the case of the arches, if no special provision were made there would be, in the heating-up process, a probability of the key-blocks slipping down, and not being forced back up into place upon reaching the ultimate operating temperature. A single rectangular block inserted at the edges of the key-block overcomes this possibility in a very simple and ingenious manner.

To-morrow (Thursday) afternoon, members of the London and Southern District Junior Gas Association will visit the Cottage Lane, City Road, works of Messrs. W. Parkinson & Co. They will assemble at the works gates at 2.30.

BENZOLE.

ITS RECOVERY, RECTIFICATION, AND USES.*

Reviewed by H. O. CARR.

THIS book by Mr. Whitehead made its appearance at the very appropriate time when the question of to be or not to be in regard to dyestuffs was being thrashed out in Parliament with much vigour. If those who are opposed to the safeguarding of the dye industry of this country could only be induced to read Mr. Whitehead's work, their opposition would be considerably weakened, if not broken down. From alpha to omega the work ranks as a standard one, and is the most complete and engrossing record that has been written concerning the recovery, rectification, and uses of benzole.

Although the volume, according to the author's modest preface, "is intended as a guide in the principles and practice of benzole recovery, chiefly applied to gas-works," it is nevertheless an excellent practical lesson to works other than gas-works where benzole is or could be recovered. "I have aimed at making the book as practical as possible, and as short as is consistent with clearness," the author tells us. His aims are most certainly fulfilled. There is little to criticize and much to praise. Lord Moulton has stamped the "hall-mark" of sterling quality on the work by an admirable introductory note.

Whenever Lord Moulton takes a lively interest in any subject, we may be sure it is good. His wide practical knowledge of the sciences, particularly chemistry, as well as his vast legal knowledge, made him a pre-eminently suitable man to take over the Director-Generalship of Explosives Supply during the late war—a position he carried through with very great credit to himself and its administration, and with such directness and speed as to constitute the department a most powerful one in bringing the war to a successful issue. This result was not achieved alone, but by careful selection of a staff of practical, businesslike people; so that the department's work progressed with such rapidity that in a comparatively short time it was able to overtake the tremendous advantage the Germans in particular had at the beginning of the war, and later to overwhelm them in regard to explosives supplies. To such an extent did this attain that at one time great difficulty was found in securing storage accommodation for the liquid bases of the explosives. Not only can it be said that the Explosives Supply Department became the most efficient of all departments; but it may also be truly said it was the most economically worked. The splendid results of the department were considerably assisted by the *bonhomie* of its staff as well as the good will, ingenuity, and patriotism of those with whom they came in contact regarding the base supplies.

Not the least of the practical, businesslike people who aided Lord Moulton was the author of "Benzole" (Mr. Whitehead), who quickly ingratiated himself with those with whom it was his duty to come in contact in connection with the recovery of benzole and toluol, and this with such *bon accord* as to win regard and benzole in a commendably short time. It is not surprising, therefore, to read in Lord Moulton's introductory note the graceful and grateful tribute he pays to Mr. Whitehead as "a most efficient member of my staff," and that "I am greatly pleased to find that he is seeking to give the world in a permanent form the results of his practical knowledge of the subject as perfected by the experience gained in the service of the Department, so that the knowledge so gained may not be lost. He is eminently fitted to perform this task, and I wish all success to his endeavours"—an excellent testimonial from one qualified to give it, and a splendid launch to any work in its world's voyage. I echo Lord Moulton's sentiments. In trusting that the book will perpetuate what we have learned, due to the war, about the production, rectification, and use of benzole, the compound which, above all others, constitutes the foundation of industrial organic chemistry," Lord Moulton says "War . . . like all other concentrations of human effort, brings with it some return in the way of new experience and wider knowledge; and it is our duty to take care that this gain is not allowed to escape us." It is pointed out as a duty, not as a pious hope.

Lord Moulton's valedictory remarks sound the keynote of what should assume the greatest importance in our minds—the position of benzole recovery and rectification as a national safeguard. He says: "At present it is humiliating to think that its most profitable economic use is to be burnt. How long will this be the best that we can do with it?" Here we have, not a question to be settled by gas engineers, coke-oven managers, and distillers, but one to be settled by the Empire. It is the question of the highest economic use of coal. That is where it starts. It is sickening to men of discernment and forethought to know what tremendous efforts are being made to increase our coal export with a view to immediate gain, when surely the coal should be used as much as possible within the Empire—not only to absorb labour, of which there is at present an overplus, but that the power of the coal should be turned into merchandise. Thus goods in far greater quantities could be exported with far greater financial gain and with more ships required to transport them. When Napoleon sneeringly called us a nation of shopkeepers, he unwittingly paid us a very high compliment. In those days, to the best of our ability, we used our coal in its most economic way Would that we might return to a nation of shopkeepers rather than provide rivals with the wherewithal to manufacture goods and oust us in our markets! In England, we have the best coals in the world. Why should we infuse our life-blood to improve the health of others, who would at the first chance push us over because of their additional strength and our weakened state?

The most economic use of coal would be to turn as much of it as possible into gas by distillation, and then we should have at command not only the artificial dyestuffs, drugs, &c., to which Mr. Whitehead refers in Part III. of "Benzole," but, in addition, products from coal tar almost too numerous to mention. Mr. Whitehead says of the commercial utilization of benzole and its products: "In addition to the large number of synthetic drugs, perfumes, and chemicals now available, there are on the market upwards of a thousand distinct artificial dyestuffs, which moreover are dealt with under some four or five thousand trade names." It must ever be remembered that dyeworks and such-like can almost instantly be turned into explosive factories; and not only that—poison gas can be produced. Are we to turn the other cheek? Shall we again allow our national existence to be undermined? I trow not. Surely we have learned a bitter lesson. I ask again Lord Moulton's question, How long will the burning of benzole be the best we can do with it?

No book has ever appeared at a more opportune moment. It is attuned to the times. Our legislators are busy with the subject. Already the Dyestuffs Bill had passed its second reading, and was being considered by a Committee. Even Mr. Asquith saw the national danger of the manufacture of dyestuffs being allowed to slip through our hands, and strongly supports the Bill and his pledges given at a time of grave national danger. Who does not remember the stirring appeal to gas men and coke-oven men in the early part of the war (when the nation was profoundly shocked at the want of explosives) and their ready response? Some works were extracting toluol within forty-eight hours of that frantic appeal. Can it be doubted that gas-works and coke-oven works saved the Empire from disaster? Let that sink into the minds of the opponents of the Dyestuffs Bill!

Surely the protection of the Dye Industry for ten years from molestation from foreign imports (as was proposed under the Bill) ought to place the dye industry economically beyond fear of attack at the end of that period. Too much delay had already taken place; the imports of German and Swiss dyestuffs were increasing apace. It was high time the measure became law. The chief opponents seemed to be the cotton manufacturers, who wished to delay the measure in order to consider what effect a possibly slightly increased cost of dyestuffs may have on their trade. They are afraid that other countries will snatch the trade from them; but it is merely trailing the herring across the ground, for their opposition is not even in their own interests. They have no foresight. Let them take comfort in that the cost of dyes to them is only from 2 to 5 p.ct. of the total cost. They secure very handsome profits, and can well afford to make a slight (if any) sacrifice. The only possible disadvantage of such a complete work as Mr. Whitehead's is that it is like a two-edged sword. It can cut both ways. No surprise would be felt if the work were soon translated into foreign languages; and it is, therefore, all the more necessary for the British nation to take advantage, as soon as possible, of the lesson it teaches.

Except for a few extracts from books on gas-works construction and management, the work is the record of the author's actual experiences on a large number of works, and speaks for itself. Other authors' works on the subject are usually a collection of other people's experiences. Sometimes they agree; often they partially agree; sometimes they flatly contradict each other, leaving the student in a quandary as to the choice of plant, method of working, &c. Mr. Whitehead's book leaves no one in doubt either as to the choice of plant or the best method of working it to full advantage. But it goes further, as will be seen on reference to Chapters VIII. and XIV., which point out the precautions necessary in working benzole recovery and rectification plants, besides showing how to overcome any difficulties. It is all very well to know how a motor car is constructed; it is equally valuable to know how to overcome any form of breakdown.

Part I. deals with the recovery of benzole from gas. The author explains what it is, its history, how it is obtained from gas, suitable plant for its extraction and recovery, and the best methods of working. He does not omit the theoretical principles, and includes a chapter on the much-debated naphthalene question. It is admirably written—clear, concise, and interesting. Nothing is left out of the reckoning.

The effect of oil-washing on the gas is set out in a clear, understandable manner. We are told what the result will be up to the extraction of 3 gallons per ton of coal—reduction in volume, loss in calorific value, reduction in illuminating power (not that this need cause any anxiety under future conditions), and effect on flame temperature and volume. Mr. Whitehead makes a great point of the two latter. He shows by means of a table that not only does the removal of benzole from gas not appreciably reduce its theoretical flame temperature, but that with the particular gas there given the value is actually increased. If gas engineers can bring themselves to be convinced, as they should be, by Mr. Whitehead's statements, then all objection is removed as regards benzole extraction in the case of incandescent burners as well as other appliances such as gas-fires. The author sums it all up by saying: "The effects of oil-washing on the gas . . . are, therefore,

* "Benzole—Its Recovery, Rectification, and Uses," by S. E. Whitehead, B.Sc., Eng. (Lond.), F.C.S. With an introductory note by Lord Moulton. London. Benn Bros., Ltd. 1920.

practically negligible—and indeed are rather advantageous than otherwise—with the exception of the reduction of calorific power." Mr. Whitehead tells us that he has verified time after time, and others have confirmed, that this reduction of calorific power is equal to 12 to 14 B.Th.U. per cubic foot gross for the recovery of 1 gallon of average 65 p.ct. crude benzole per ton. As he very rightly says, the universal tendency for some years has been towards a lower grade of gas; and in view of the many applications now being made to the Board of Trade under the new Act, who can deny this tendency? The applicants are waiting in a long queue. The slump in calorifics has started. The days of illuminating power are past.

There may be a deal of controversy as to Mr. Whitehead's estimate of the value of the gas lost by the extraction of 1 gallon of benzole per ton of coal at 2d. when gas is sold at 5s. per 1000 c.ft., because that is a figure *per se* and does not take into consideration other losses. But there is a great deal of comfort when he compares the loss with the gain. We are told that the total cost of extraction and recovery is 2d. per gallon in the case of motor benzole, and that complete rectification costs 3½d. per gallon, to which must be added 17 p.ct. per annum interest on capital outlay, depreciation, and maintenance, whereas the present-day sale price of the finished product is in the region of 4s. 6d. per gallon. This is a very healthy margin if Mr. Whitehead's figures can be relied upon; and a man of his wide experience no doubt has had ample opportunities of verifying his figures.

In the author's "Reasons for General Adoption of the Process," he says: "There is, moreover, little fear of reducing the market price by over-production, because, if all the available benzole in the country were recovered, it would not be sufficient to meet the whole of the demand for motor fuel alone." One can cordially agree with Mr. Whitehead, because if an average of 2 gallons of crude benzole per ton of coal at present distilled in the United Kingdom were extracted, it would hardly reach 30 p.ct. of the motor spirit sold when manufactured into the standard article. This does not allow for its uses for dyestuffs, cleaning, and other purposes. So, with the present extraction of considerably less than 1 gallon per ton, there need be no fear as to competition, especially as it is generally admitted that benzole as a motor spirit is superior in power to petrol. Mr. Whitehead brings forward many cogent facts in Chapter XVIII. [Benzole as a Motor Fuel] as to its suitability and superiority to any other power producing spirit. When he points out that alcohol will not mix freely with petrol, but that alcohol and benzole are miscible in all proportions, further advantage is shown in benzole's favour; and it may be hoped that in the course of time the whole of the internal consumption of motor spirit can be home produced and keep a considerable amount of wealth within this country. Moreover, alcohol has to be "denatured;" but it can be safely said that a mixture of alcohol and benzole would be regarded as anything but pleasant refreshment.

We are given complete methods and advice in Chapter III. as to extracting crude benzole from gas—the proper plant, the best materials to use, and the control of the process. No other book contains so much concentrated information. I should have liked the author to have included wood grids as a method of filling an oil-scrubber, because it has been found at several works to give excellent results. Mr. Whitehead pins his faith to boards, which also give excellent results; but it may be remarked that boards are liable to warp whereas wood grids do not, and whereas boards close together are liable to blockage, wood grids year in year out never block. Wood grids have the additional merit of more frequently altering the direction of the gas and of the wash-oil, as well as of more frequently subjecting the gas to dripping oil in its passage when the grids are made of square sticks crossed. Those who have had any difficulty as to efficiency or blockage of a scrubber should bear wood grids in mind, because they create no back-pressure, are self-clearing, and present a larger surface to the gas, as well as the advantages already enumerated. For these reasons they are also highly recommended for ammonia scrubbing. With this additional information, no one need ever go wrong if he follows the advice given in Chapter III.

Chapter IV. [The Debenzolizing Plant] is as replete with knowledge and as explicit as the previous chapter. It is brimful of sensible advice and information, and will be read with great interest. It is profusely illustrated. No plant of merit is missed; while nothing unimportant is included.

In alluding to the "Wandsworth" crude benzole plant, Mr. Whitehead attributes its good merits entirely to Mr. H. O. Carr; but it may be remarked that Mr. U. O. S. Nairne should also have shared in its praise, and it is the wish of the former that the latter should be fully recognized in connection with that plant. The design of the plant was as a matter of fact partially modelled, but greatly altered and improved, on a "home-made" plant erected at the Bankside Works of the South Metropolitan Gas Company, to whom also credit is due and has already been acknowledged on the plans of the "Wandsworth" plant issued in the war. It certainly played an important part during the war, because it was of home-made materials, and thus was able to be erected and at work in a short time, and at a time when it was imperative that the supplies of explosives should be augmented. But there were also a great many very ingenious plants erected at the smaller gas-works during the war which played an important part, and will always be a matter of congratulation to those managers who so patriotically placed their services and brains at the disposal of the country.

To Chapter V., where the accessory plant is dealt with, I give unstinted praise, because that is where engineers erecting plants are likely to find themselves at a loss; and it is not a matter on which much information is given in other works on the subject. These aids are of exceptional value.

In Chapter VII. we come to the subject of dephlegmation and the very important question of naphthalene. I can say at once that where the management of a gas-works does not intend to extract benzole the chapter is nevertheless a useful one, giving as it does many different kinds of efficient apparatus and methods of working which should effect a cure of the naphthalene trouble.

Mr. Whitehead mentions, but does not lay nearly enough stress upon, the fact that where benzole extraction plant of good design is already provided, or is eventually provided, it is not at all necessary to adopt any of the other measures advocated, because the benzole extraction plant, if properly worked, can be made to extract every vestige of naphthalene, so that no deposit takes place in any part of the gas-works or, more important still, in any part of the district supplied.

The method of working in question is to pass a certain quantity of denaphthalenized oil a sufficient number of times through the gas to satiate the wash-oil in its appetite for naphthalene. This can be done by taking out about ½ gallon of crude benzole per ton—the crude benzole consisting chiefly of naphthalene and heavy hydrocarbons. As Mr. Whitehead himself points out, wash-oil has the faculty, after it has been used a sufficient number of times to wash the gas, not only of refusing to absorb more light oils but of abandoning them to the gas in preference to heavy hydrocarbons including naphthalene.

At some large gas-works using horizontal retorts only for coal gas made, and therefore liable to a larger number of grains of naphthalene per 100 c.ft. than by any other method of retorting, this practice has obtained for a considerable period, with the result that not only are the pipes from the extraction plant entirely free from any trace of naphthalene, but the mains and service pipes on the district are also entirely free of naphthalene and have been in both cases for a long time. The debenzolizing plant deals with the naphthalene charged oil without trouble. The wash-oil is freed from naphthalene and re-used. There is no reason why many other works already possessing benzole plants should not cause their plants to give them entire freedom from this old and despotic enemy. The financial economy is enormous when one considers the cost of redundant labour, let alone the annoyance to consumers as well as a temporary loss of supply of gas to consumers and many other abstract losses—and all the time the benzole extraction plant may be idle. If for no other reason, it is well worth bringing the plant into action again or providing one where none exists.

I can entirely agree with Mr. Whitehead when he states that much of the complaint of naphthalene trouble during the war was entirely due to old deposits of naphthalene in the mains; whereas the benzole extraction was blamed for taking out the so-called "carriers," although as a matter of fact it was due to the naphthalene-free gas picking up the old deposits in the mains and re-depositing them in the cooler service pipes. I also agree that improper wash-oil containing a large percentage of naphthalene was supplied during the war and added to the trouble; but as is pointed out, wash-oil in the first instance should be free from naphthalene or made so before use in the scrubber.

As to the patience which must be exhibited, Mr. Whitehead says: "In one large undertaking no trace of naphthalene could be found leaving the works for nearly a year; yet towards the end of that period, 0·56 p.ct. of the consumers per month were complaining of stopped services. The removal of this state of affairs is practically a question of time only. This time is something over a year, but certainly less than two years for the complete elimination of naphthalene from the gas supply system. To show how quickly the trouble can arise again, I know that at some of the works using benzole plants as naphthalene eliminators, for certain reasons the plants were stopped; and although the districts had been entirely free of naphthalene stoppages for a considerable time, yet within a very few days thousands of service pipes were stopped as well as small mains, due to the temperature in the services and the small mains being at such a degree as to invite the depositing of naphthalene. When the benzole plants were again brought into operation for naphthalene elimination, the trouble quickly disappeared."

Part II. deals with the rectification of benzole, and is of absorbing interest. It describes at great length and clearness the various processes the crude benzole has to endure before it becomes motor spirit or highly finished benzole to Government specification. It is written with the same thoroughness, accuracy, and care as the author has taken throughout the book. As previously remarked, no one need go wrong with this book at hand.

Part III. deals with dyestuffs, but also contains a very interesting chapter on explosives, as well as the very important subject of benzole as a motor fuel.

The last chapter (there are nineteen in the book) contains useful information as to the subsidiary uses of benzole products. As I have already referred at some length to several of these subjects, I will add no further comments.

The work ends with two appendixes, A and B—respectively analyses of crude benzole by Dr. Colman's method, and useful data and tables—and a convenient index.

I conclude by saying that Mr. Whitehead's book "Benzole" is a

plain, unhesitating tale of what is best. There is no vacillation. It is amply illustrated with very clear impressions, printed in clear type untiring to the eye, and is replete with sound practical knowledge and advice. I heartily congratulate Mr. Whitehead on his effort. There is no book on the subject its equal. It has an enthusiasm and fire about it which is rarely, if ever, met with in technical books, and which would do much to sustain interest if they had. It is smooth and pleasant to read. May it be a means whereby the most vital industry for the safeguarding of our Empire will be dominantly secured to those of true British nationality. If "Benzole" materially assists to do this, then it will secure lasting gratitude to Mr. Whitehead.

PUBLIC AUTOMATIC LIGHTING.

IN 1906 [see "JOURNAL" for Feb. 27], attention was drawn to the interesting apparatus for the automatic lighting and extinguishing of gas-lamps which had been put on the market by the Horstmann Gear Company, Ltd., of Bath; and it is gratifying to find that the publicity then given to the invention brought these instruments to the notice of gas managers, so that quite a substantial industry has since been established in Bath for the production of these and similar automatic appliances.

We now understand that Messrs. Horstmann have introduced the method of mass production into their works, which has reduced these instruments to exact interchangeability, ensuring almost unlimited output and consequent low price, while maintaining the highest possible efficiency. This method of manufacture was suggested to the firm by the use of the munition gauges which they manufactured during the war, for testing munition components in different localities, many of which were not assembled until they reached the military base. By this system, a large and rapid output was obtained. These gauging methods are the crux of mass production; and the writer was shown the components of the Horstmann controllers in their various stages of development, gauged both at the machines and in the inspection departments by limit gauges of varying tolerances. For the ten or twelve years that these controllers had been on the market prior to the war, in common with most other clockwork instruments, the horological portion was manufactured abroad; the patent parts being added in this country. By the methods now adopted, the foreign part is eliminated, with the exception of a very small portion of the material.

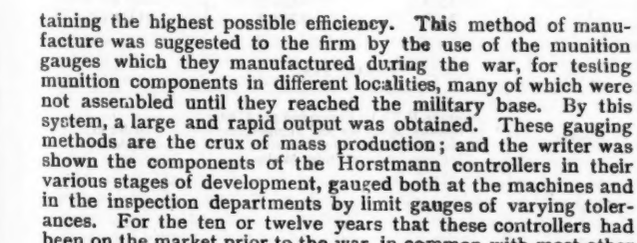
GAS CONTROLLERS MANUFACTURED BY MASS PRODUCTION.

UPRIGHT PATTERN. INVERTED PATTERN. VERTICAL PATTERN.

Type 3A (Upright). Type 3A (Inverted). Type 3A (Vertical).

Type 3A (Fourteen-Day).

UPRIGHT PATTERN. INVERTED PATTERN. VERTICAL PATTERN.



Type 3 (Upright). Type 3 (Inverted). Type 3 (Vertical).

Type 3 (Eight-Day).

The first Horstmann controller was rather a complicated instrument, being devised primarily to effect instantaneous lighting; slow lighting having proved very inefficient in conjunction with incandescent burners. The Type 1 controller also had an equation device for automatically adjusting the times of lighting and extinguishing to a given schedule (supplied by the gas engineer). Two factors, however, mitigated against it: 1.—Schedules were constantly being changed, necessitating new cams. 2.—The disinclination of some gas managers to place a lamplighter in charge of really scientific instruments.

The makers then put on the market several types of hand-setting controllers; and it is these which have been reduced to interchangeability, by mass production. They are known as the "Newbridge" controllers. The simplest of these instruments is the Type 3A, which requires winding fortnightly. This controller has many simple and useful methods of overcoming the defects which the earliest types of controllers exhibited—*i.e.*, the act of winding does not interfere with the dial-plate, through the centre of which the winding spindle passes. The power is maintained during winding; and the "on" and "off" levers, which directly operate the gas-tap in an instantaneous manner, can be adjusted on the dial-plate by one hand, without disturbing the time at which the dial-plate is set. Thus the winding, the time-setting, and the adjusting of the times of lighting and extinguishing are quite independent of one another, and can each be operated or adjusted without disturbing the other elements. In this controller, the gas-plug is actuated by a spring-propelled lever, direct from the "on" and "off" levers. Another feature is that these levers discriminate—*i.e.*, the "on" lever cannot turn "off," and the "off" lever cannot turn "on."

An earlier type of instrument—Type 3—which differs slightly from Type 3A, in that the gas cock is operated by the main spring, through a train of wheels terminating in a crank and slide mechanism, has also been standardized. This instrument having achieved great popularity among gas managers, is still ordered in large quantities; but owing to part of the power of the mainspring being utilized for the driving of the gas-cock, the clock runs eight days instead of fourteen. Both these instruments are, as shown in the illustrations, fitted in three cases of different pattern, to suit the various types of lighting inside upright lanterns.

The powerful operation of the crank and slide mechanism of Type 3 renders it capable of operating very large gas-plugs; and the Type 5 instrument operates gas-cocks for pipes up to 1 in. diameter. This instrument is particularly suited for group-lighting in flats, and for commercial purposes, including water controllers for preventing waste at night.

There still exists a demand for the original Type 1 controller, with automatic adjustment of the times of lighting and extinguishing; and the makers have applied this principle, by a slight modification of their Type 3 controller already described. The automatic dial is now made more substantially than formerly, and is mounted on the barrel sleeve, as in Types 3 and 3A; and the time is read by the time-pointer, instead of by a pair of clock-hands. But as the equation mechanism overlaps the centre of the dial, the winding-spindle is geared to a lower position, instead of going through the centre of the dial. This model is known as Type 1A.

All these controllers are made with standard gas-plugs, which can be removed for cleaning without disturbing the clockwork mechanism. Further modifications of the instrument provide for the lighting of groups of burners at dusk, extinguishing the majority at midnight, or thereabouts, and the remainder at dawn [Type 4]; for lighting and extinguishing twice in 24 hours; and for extinguishing the bye-pass during lighting hours. All types of controllers can be provided with outer cases, for the suspension and operation of gas arc lanterns, some of which are provided with levers for hand-action in case of fog emergency.

Incidentally, it may be said that the Horstmanns, being originally clockmakers, have approached this question from the expert horologist's point of view, and having specially designed their controllers to meet the requirements of many of the largest installations in the country appear to have attained "the last word" in the matter of automatic lighting; while their mass production methods have assured low prices, high production, exact interchangeability, and extreme precision.

On Saturday of next week (Jan. 15) the Scottish Junior Gas Association (Eastern District) will visit the Markinch Gas-Works and the Rothes Paper Mills. After the inspections, the visitors will be entertained at tea by the Markinch Gas Company; and subsequently there will be a discussion on the paper on the "Tully Water-Gas Plant," read by Mr. H. Rule, of Kelty, at the recent Dundee meeting—see "JOURNAL" for Dec. 22, p. 704.

The three final lectures by Mr. W. A. Tookey, M.Inst.Mech.E., on "Gas Power," will be given at the Westminster Technical Institute at 8 p.m. on Fridays, Jan. 14 and 28, and Feb. 11. The subjects of these lectures will be respectively: (1) "The Management of Gas-Engines," dealing with the practical details of operation, including hints upon running, repairs, and adjustments, and a description of difficulties an extended experience suggests. (2) "The Comparison of Gas Power with other Competing Motors." (3) "Composition of Power Gases," and general discussion.

Drawings by Mr. Fred. Bredel of features adaptable to horizontal retorts, presented in the Carbonization Report of the American Gas Association, showed the top of the retort thicker than the bottom and sides. This, he pointed out, is to prevent superheating the evolved gas, doing away with stopped stand-pipes, pitch in the hydraulic, destruction of the ammonia, and the formation of naphthalene. The result is a much larger output of ammonia and tar, and a somewhat higher yield of a better B.Th.U. gas per pound of coal. Mr. Bredel says this thickening of the top of the retort attacks the trouble at the point where it should be attacked, by preventing the decomposition of the gas; while all other ways of handling the difficulty—such as scrubber stand-pipes—simply try to relieve the trouble when it already exists. In other words, the one is a preventative and the others are remedies.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A Meeting of the Yorkshire Junior Gas Association was held on Dec. 18, at the show-rooms of the Halifax Corporation Gas Department. Mr. G. DOUGILL, the President, occupied the chair; and there was a very good attendance.

COOKER RESEARCH.

Mr. W. HEATHCOTE (Halifax) delivered an address dealing with the above subject.

In his opening remarks, Mr. Heathcote referred to the many reports on research work in connection with gas lighting, fires, and water-heaters (recent improvements having brought these appliances to a high state of efficiency), but considered there was much leeway to make up as to the gas-cooker. He proceeded:

The early prejudice in the use of a gas-cooker was greatly intensified owing to an entire misapprehension as to the physical laws involved in roasting (say) a joint of meat. It was concluded that the joint would absorb some of the products of combustion and become tainted. This is well known to be a physical impossibility. Closed ovens are a costly concession to some of these prejudices. The shell of such an oven has obviously large surfaces in contact with the atmosphere. In the interests of fuel economy, all exposed surfaces should be protected by suitable coverings to conserve the heat. The loss of heat from a gas-oven is due to: (1) The large volume of heated air and gases passing through the the oven and out at the flue. (2) Conduction through the oven walls. (3) Convection and radiation of the outer walls.

The ventilation should be balanced to clear the oven of the products of combustion and any steam generated from the food being cooked. Any provision allowed above this requirement means a cold oven and a considerable increase in the gas consumption to overcome this fault before the temperature is raised sufficiently to undertake the necessary work. If the ventilation is restricted, the consequences are a cold oven, through incomplete combustion, and the generation of noxious gases, also the danger of the oven space being filled with combustible gases, tending to grave consequences.

Conduction through the walls varies in proportion to the difference of temperature between the inside and the outside. Losses on the outer walls increase rapidly as the temperature of the hot body increases.

The heat given off by radiation depends not only upon the kind of metal, but also upon the roughness or smoothness of the surface. Cast iron is good in this respect; and the amount of radiant heat can be increased by painting it with oil paint or lamp black. The relative radiating values, taking lamp black as a 100, are: Glass 90, cast iron 60, copper 12, brass 11, highly polished brass 7, polished copper 3. Materials for insulating are very varied, one of the best being hair felt; but this substance is not suitable, owing to the destructive effect of high temperatures upon it and the possibility of charring. Air, when confined, makes an excellent non-conductor of heat. The term non-conductor is used in a relative sense, for there is no perfect non-conductor. The best insulators allow a proportion of heat to pass.

Mineral or slag wool is recognized as one of the best insulators for gas cooker ovens. The value of an insulator is due to the proportion of minute air spaces in the substance. This condition is met in slag wool by the enormous number of fine threads between which fine air spaces occur. There is a point when the weight of the insulating material gives the best results. When the material is too closely or too loosely packed, the heat loss increases—in the former case because of the increased conductivity of the solid material; in the latter, because of the greater loss by convection.

After referring to early experiments of Mr. Thomas Fletcher on the heat expended on radiation by gas-ovens, Mr. Heathcote proceeded:

TESTING A COOKER OVEN.

I have undertaken a number of simple tests that may prove interesting. The particulars ascertained are the temperature rise, time, gas consumption, total number of heat units expended in raising the cubic contents of the oven to a certain temperature, &c. I am convinced that these particulars are of value in determining what design of oven is capable of utilizing efficiently the gas consumed. It is surprising what a wide range of results has been obtained in different popular types of cookers; and it is a matter for serious thought when we consider how many heat units it is necessary to expend in raising the temperature of 1 c.ft. of air in some of them. To ascertain the amount of heat that is capable of raising 1 c.ft. of air 1° Fahr., it is necessary to know the specific heat. The specific heat of a body is its capacity for heat compared with that of an equal weight of water. The specific heat of air under constant pressure is 0·2375.

Calculation Based on the Specific Heat of Air.

1 c.ft. of air weighs 0·0864 lb.

Therefore $\frac{1 \text{ lb. of air}}{0{\cdot}0864} = 11{\cdot}574$ c.ft. and $\frac{11{\cdot}574}{0{\cdot}2375} = 48{\cdot}77$ c.ft; so 48·77 c.ft. is raised 1° Fahr. by 1 B.Th.U.

Therefore $\frac{1}{48{\cdot}77} = 0{\cdot}02$, which can be used as an average figure (or constant) to base the amount of heat necessary to raise 1 c.ft. of air 1° Fahr.

COOKERS TESTED.

1.—Sheet-metal cooker, heated by a ring-burner. The products of combustion pass through a circular opening in the base of the oven, ventilated by a 1 in. flue.
2.—As above, but sides and door insulated with ½ in. slag wool.
3.—High-grade cooker, popular type, smallest of five sizes ventilated through open crown.
4.—Ordinary cooker, studded dome, packed crown, ventilated through a port in the centre of crown, which communicated direct to flue. Sides and back of cooker extend to the floor, drillings at the base for secondary air.
5.—Ordinary cooker, separate combustion chamber. The products pass from the combustion chamber through a port at the bottom right side into the cooker, traverse same and out at the top left-hand side of open crown, thence to the flue, which is fitted with a fine-mesh gauge.
6.—Ordinary cooker (new pattern), special burners. Ventilation through open crown.
7.—Sealed cooker.
8.—New type cooker, open crown slotted in the centre similar to No. 4.
9.—One of the latest type high-grade cookers.
10.—High-grade cooker, open crown.
11.—Reconstructed No. 10 cooker (see special description).

TABLE I.—*Capacity of Oven, Consumption, and Temperature Rise in 15 Minutes.*

Cooker.	Capacity of Oven.	Consumption.	Temperature Rise.
	C.Ft.	C.Ft.	° Fahr.
1	1·00	5·00	434
2	1·00	5·00	514
3	1·45	7·65	414
4	2 40	5·20	254
5	2·70	4·55	154
6	2·43	5·50	206
7 (20 min.)	1·84	10·70	138
8	2·64	7·95	298
9	2·91	8·40	190
9*a*	2·91	7·30	314
9*b*	2·91	7·70	324
9*c*	2 91	7·45	354
10	2·94	9·30	368
11	2·94	7·90	404

TABLE II.—*Exposed Surface, B.Th.U. Lost by Radiation and Convection.*

Cooker.	Exposed Surface.	B.Th.U. lost, allowing 0·28 B.Th.U. per Sq. Ft. per Degree Difference of Temperature.	
		Total.	Per Square Foot.
	Sq. Ft.		
2	7·3	1050·4	143·9
3	10·7	1240·1	115 9
4	13·0	924·3	71·1
5	15·8	680·9	43·1
6	13·0	748·8	57·6
7	14·1	544·2	38·6
8	13·0	1084·2	83·4
9	14·1	764·2	54·2
9*a*	14·1	1239·3	87·9
9*b*	14·1	1278·8	90·7
9*c*	14·1	1397·3	99·1
10	15·1	1555·3	105·0
11	15·1	1707·8	113·1

TABLE III.

Cooker.	Average B.Th.U. Expended per C.Ft. of Interior Space for 200° Temperature Rise, allowing Loss by Radiation and Convection on Outer Walls.	Order of Efficiency.
2	511	..
3	896	10
4	573	6
5	811	9
6	686	8
7	3707	12
8	607	7
9	1129	11
9*a*	559	5
9*b*	471	3
9*c*	370	2
10	480	4
11	306	1

NOTES.

Cooker No. 4.—High flue temperature, the temperature of the products being 234° when the oven was 270°.
,, No. 8.—High flue temperature—products 290°, oven 300°; products 356°, oven 360°.
,, No. 9.—Tested as sent out by the makers.
,, No. 9*a*.—Deflector and bottom plate removed.
,, No. 9*b*.—Deflector plate only removed.
,, No. 9*c*.—Deflector plate removed and flue reduced.

Cooker No. 10.—Reduced flue before test until a balance was secured to just ventilate the oven. To maintain a temperature of 400° Fahr. required a consumption of 12 c.ft. per hour.

,, No. 11.—To maintain 400° required a consumption of 12 c.ft. per hour.

,, No. 11.—Reconstructed No. 10 high-grade type as supplied by the makers. Heated by two bar-burners, one on each side of the cooker. Ventilation—open base through open crown and 3-in. flue.

This latter cooker was reconstructed as follows: The two burners were taken out and replaced with one, fixed at the same level but in the centre; the primary air intake being outside the cooker casing. The bottom of the cooker just below the burner had a plate of sheet-metal fitted. This was perforated with eight ½-in. holes to supply secondary air to complete the combustion of the gas. The flue is dispensed with and the crown packed instead of being open. The products of combustion pass through five ½-in. holes in each of the three linings, down between the linings and the casing, and finally discharge through a number of ½-in. holes near the base of the cooker. The sides have been fitted with an additional casing and packed with ¾ in. of slag wool to conserve the heat.

It is surprising what a small amount of ventilation is necessary. I have reduced the outlet perforations to six, and still the combustion is complete. The flames being short and keen, they did not lengthen, nor was their character altered by reducing the outlets to the above number.

Area of 3-in. flue	..	7·069 square in.	.. Original ventilation.
,, six 0·5-in. holes	..	1·177 ,,	.. Ventilation after reconstruction.

Test of Large Cooker.

Interior, 15·36 c.ft.; exterior, 45·5 sq. ft.

*Minutes.	Temperature.	Consumption.	Flue.	
5	*Nil*	4·35	*Nil*	Flue—10·6 sq. in. packed crown flue in centre of oven.
10	*Nil*	8·9	*Nil*	
15	220	13·4	212	
20	240	17·85	232	
25	250	22·25	248	
30	270	26·7	260	
35	290	34 7	280	
40	310	40·0	300	

Temp. Difference.	Total B.Th.U. Expended.	Total B.Th.U. Lost by Radiation.	B.Th.U. Per Square Foot.	B.Th.U. Expended Interior, Less Loss by Radiation.	Average B.Th.U. Per Cubic Foot @ 200° Difference.
176	5668	2242	49·2	3426	253

NOTES.

Ovens should be constructed to have as little exposed outside surface as possible in proportion to interior cubicle contents.

* Final figures (reconstructed cooker), 306; large cooker, 253; accounted for by the larger proportion of square feet of exposed surface to internal contents (in cubic feet—respectively 5·13 and 2·96.

No doubt large cookers are more efficient than small ones for this reason. (See note above.)

In this particular cooker a large volume of high temperature products discharges through the flue. At one period, there was only 2° difference between the oven and flue temperature. It would be interesting to have a large cooker of this type altered in a similar manner to the small cooker (No. 11), and then note the difference of the temperature of the oven.

COOKER OVENS—SUMMARY.

There is ample room for improvement in the gas-oven, with a view to increasing its efficiency. The possibility of regeneration is worthy of serious consideration. An effort should be made to utilize profitably the high-temperature products of combustion, which have in some cases been as much as 356° Fahr. higher than the average cooking temperature. It is very unsatisfactory to discover such a large volume of heat passing away to waste without any endeavour being made to reclaim a portion.

It is doubtful if the burners when fixed at the sides are in the best position. Users were advised to hang the joints in the oven and allow the juices and fat released during the cooking to fall into a drip-tin placed under the base of the cooker; and the burners were fixed at the sides to protect them from this dripping fat, &c. It is well known what is the consequence when joints are cooked in this manner. Grease is splashed on to the sides, resulting in complaints that, when the oven is in use, there is a disagreeable smell. In many cases, too, the fat is burnt; and it is very difficult to remove. It is recognized to-day that joints should be placed in closed tins to obviate this nuisance. It is interesting to test the travel of the products of combustion from burners placed at the sides. The products rise vertically through the oven until they are baffled against the dome, when they fill the upper portion and descend about two-thirds of the oven space—the centre of the lower third being always a cold zone. If the burner is fixed in the centre, there is a more equal distribution of the heat; and this can be increased by radiation from the hot linings if the products are conducted between the lining and the casing.

The primary air intake should in all cases be outside the oven. This position is also more convenient for adjustment. A large open flue direct from the oven is not desirable. I do not see the advantage of open crowns—they are simply hot chambers which radiate a very small proportion of heat back in the oven. A packed crown is more efficient. All ovens should be insulated to conserve heat.

The heating of the oven is mainly by convection. There is a very small percentage of radiation; so that really the cooking done is not roasting but baking. The finest roasts are done by radiant heat; and expert cooks to-day carry this out by hanging the joint on a spit before an open fire. Is it too much to say that we should make an effort to do work in a similar manner by gas? A cooker could be designed with radiants in the lower portion of the oven; the products rising to the upper part for baking purposes. This would be carried further by constructing a section cooker on similar lines to one that has already been manufactured, known as the "elastic" cooker, but having the bottom portion heated by radiants and used for the dual purpose of roasting and baking as already described. If required for baking only, the upper portion could be partitioned by a shelf to which a second set of burners would be fitted which would register with nipples separately controlled, the consumption being reduced proportionately to the amount of oven space required.

Large, or what are known as massive, roasters could be heated entirely by radiants.

HOT PLATE.

We are all aware of the important fact that due consideration should be given to the arrangement of the burners and their spacing—allowing sufficient room for the various duties required of them—and also to the correct distance the burners should be placed below the top bars with the view of complete combustion taking place when the gas is lighted. There is still a difference of opinion by the makers; and we come across varying distances at which they are being fixed. These positions will effect their efficiency.

The present system of boiling water by gas is very imperfect. We often hear of high efficiencies being obtained from certain burners; and claims are made that this is due to high flame temperature in conjunction with flame contact. High flame temperature is desirable and obtainable; but I fail to see how flame contact is established with the ordinary type of utensil that is in general use. In fact, I am convinced that it is not possible to obtain it with such a surface as is usually presented to the flame—this being cold. This fact can be perceived by placing a utensil with a flat surface over a gas-flame, when a clear space will be seen between it and the flame. We know that gas has to be raised to the temperature of ignition before combustion can take place. Ignition temperatures are somewhere in the region of 750° Fahr. for CO, to 1100° for H and certain HC; and it naturally follows that the flame is extinguished at that position where it comes in contact with the cooling power of the utensil and its contents, which never attain a higher temperature than 212° Fahr. when the contents are mainly water, and the few degrees higher if the contents are of a greasy nature. Convected or conducted heat is absorbed by any body in direct ratio to the difference between its own temperature and that of the source of heat in absolute contact with it. Therefore, it follows that the source of the heat being unburnt gases at a low temperature the transference cannot be very great. This can to a limited extent be compensated for by constructing the utensil with a greater heating surface.

Flame contact can be obtained, coupled with an increased efficiency, not by any new design of burner, but by an alteration in the design of the utensil.

Regarding the design of hot plate burners of recent make, I cannot see any great departure from those which already have been in use at some period or other. The results obtained are claimed to be very high; but, personally, I have not been able to obtain similar results under satisfactory conditions—viz., reasonable time in boiling.

Having given the results of a number of tests carried out by himself, using vessels of various kinds, Mr. Heathcote went on to say: I am sure good results would accrue if research work was conducted with the view of applying the principle of surface combustion to boiling burners. We must get away from existing designs. Have any experiments been made to try to convert the energy of combustion into radiant form and to transmit it to the contents of cooking utensils? I am positive there is plenty of scope in these suggestions.

I suggest that gas-cookers should be supplied complete with suitable vessels for use on the hotplate. The average vessel employed to-day is ancient in design—practically no departure from what has been used for heating over a coal-fire. It does not necessarily follow that what is suitable for solid fuel heating is equally good for gaseous heating. The flat bottom kettle is the best form when it is desired to utilize radiant heat; and it is eminently suitable for use on a coal-fire, seeing that the bulk of heat during combustion is in radiant form.

There is great room for improvement in the grill burner. For this work we rely wholly upon radiant heat for toasting and grilling. The blue flame is capable of giving about 15 p.ct. radiation. For the remainder we rely upon about 50 p.ct. of the flame coming in contact with a metal fret, bringing it to a red heat and deflecting it on to the food being cooked. For boiling purposes, the average grill burner gives very poor results. It will do a certain amount of work; but unless the vessel is large, the efficiency is very low.

The practice of fitting a central grill burner between two grill plates should not be continued. Is there any necessity why every cooker should be fitted with a grill burner? What percentage of

people using cookers make a general practice of utilizing the grill? I doubt if 50 p.ct. do. Small consumers would be quite satisfied if the hotplate contained a range of about three efficient boiling burners—the sizes being graduated. Grill burners could be supplied as an addition if desired. Larger cookers could have this burner fitted as part of the equipment.

I should like to see an improved grill burner fitted with suitable radiants, the flame burning centrally in each and converting the bulk of the heat generated into radiant form of energy, with suitable white enamel deflectors confining the heat and helping to throw it in the direction required. An experiment on these lines gave the following results: Area of heating surface, 17·5 sq. in. (5 in. by 3½ in.); 1·25 lbs. of water heated from 62° to 126° Fahr. in 5 minutes; the consumption being 1·15 c.ft. The absorption per c.ft. was 69·56 heat units; the efficiency being 16·44 p.ct., as against the two previous tests of 10·04 and 8·67 p.ct.—an increase of 63·74 and 89·61 p.ct. respectively.

HOT-PLATE BARS.

Heavy cast sections and straight bars crossing the flames conduct away a proportion of heat that could be more profitably utilized. Prof. H. Adams says that 233 thermal units are transmitted by conduction by iron 1 in. thick per hour per 1° Fahr. difference of temperature. In many cases these types of bars break across the inner cone of the flame, retarding combustion and lowering the efficiency. The most suitable bars are those in which the metal is well away from the flame, and fitted with studs to raise the utensil off the bulk of the ironwork. This also helps combustion by allowing access for sufficient secondary air, also an easy exit for the products of combustion. If there is any effort made to confine the heat, the products are also restrained; and this will nullify any advantage in this direction. An excellent paper was read recently on this subject,* and I am not disposed to enlarge on it, further than to say that I agree with the stand taken by the author, and that I confirm his views.

STANDARDIZATION OF COOKERS.

Variety excites interest, and variety increases sales. We must have variety for this reason. We must also have variety in order to encourage designers to improve on what has been or what is available. But we must also have a standard to satisfy the general demand.

I think it would be advantageous to standardize (say) about four sizes of gas-cookers. These would be suitable for hire purposes. But serious thought should be given to their design, so that they may embody every practicable improvement; otherwise the standard would soon be superseded. The present cupboard style of British cooker has the advantage of being compact, which is a consideration in the average small kitchen. It is, however, inconvenient, seeing the amount of stooping that is necessary when the oven is in use. The oven should be raised on a stand to a convenient height; while the hot-plate should be separate from the cooker and housed on the same stand as the oven. The hot-plate should be hinged, and when not in use could be folded back to the oven. The space left on the stand could then be used for other purposes. The oven should be insulated. All control cocks should be mounted on a rail sufficiently large to carry the necessary gas volume to feed all the burners without a large drop in the gas pressure. The rail should be fixed at the front of the hot-plate, and the injector nipples be adjustable. The injector mixing tube and orifices should be properly proportioned to each other.

If the burners are drilled to suit the quality of the gas, there is no need to have air sleeves to control the primary air. All burners, carriers, &c., on the hotplate should be easily removable. Special attention should be given to the proper level for the burners below the hot-plate bars, and properly-designed hot-plate bars should be supplied to reduce conduction losses to the minimum. If ring-burners are adopted, they should only have one flame circle, or, alternately, drillings staggered on the inner and outer rings, to provide for ample secondary air for complete combustion and without fouling the same. Grill burners should be of double pattern, and grill plates hinged. If required for boiling purposes, a duplex burner is preferable.

VENTILATION—WHEN FIXING THE GAS-COOKER.

Cookers with provision for a flue will probably be insisted upon for a considerable time to come. One of the largest gas undertakings in the country has fully 99 p.ct. of the cookers fixed with no extensions to the flue. Flue pipes were not even fixed when expressly requisitioned by the consumer, except in cases where a permanent brick shaft existed. This undertaking took care that the cookers were fixed in suitable positions, with due regard to light and air space; and they had the satisfaction of knowing that the cooker was considered a necessity by the bulk of the consumers. Complaints were few and far between. The investigation of complaints regarding difficulties experienced in the baking of bread in gas-ovens have been traced to want of ventilation caused by flues and pipes that failed to discharge the products of combustion, and therefore, so to speak, "stopped the job."

A flue just extended through an outer wall should not in any circumstances be allowed. In the majority of cases, instead of being an outlet it is an inlet, returning the products of combustion back to the burners and smothering the flames through the absence of the necessary oxygen for combustion. A moment's thought will convince the most sceptical that this form of extension is doomed to failure. There are still people who cling to the idea that fancy cowls or different designs of terminals—lobster backs, T. and H. pieces, revolving cowls, &c.—will overcome their trouble and convert a defective outlet into an efficient ventilator with a positive up-cast. Let me emphasize at this stage that if a flue is satisfactory with a patent cowl it will be equally satisfactory with an ordinary cone cap. The claimed object and function of a cowl is to prevent the entrance of gusts and eddies of wind down the flue and to assist the aspiratory power of the wind. Investigations have proved that the majority of cowls possess no practical advantages over the simple open tube. The only addition required to the end of the flue is a conical cap to keep out the rain and any gusts of wind that may be deflected downward. Patent cowls will not prevent downward suction; neither will revolving mechanisms effect upward suction.

It is an exceptionally good chimney of fair height that will show 5-10ths of an inch draught. What will be the draught on an extension to a gas-cooker flue? Practically a small fraction of 1-10th of an inch.

SYPHONAGE.

All outlets must work under similar conditions—commence at the same levels and discharge at the same height (above the ridge). Syphonage can take place on calm days. Imagine a gas-cooker fixed in a house with an extension through an outer wall, like the majority of dwelling places. There has been no provision for fresh air except through cracks round doors and windows, &c. A large fire is lighted, being ventilated by an ordinary flue (say 14 in. by 9 in.) the up-cast being 6 ft. per second. This flue is capable of extracting nearly 19,000 c.ft. of air per hour, failing adequate inlets (which is often the case) to admit of a corresponding volume of air. It necessarily follows that the supposed outlet from the cooker is converted into an inlet. This will also happen when the cooker is fixed in the kitchen, where there is a powerful chimney, even when the fire is not lighted. This rapid extractive force will reverse the current in other and less powerful outlets.

I think I have explained sufficiently why a flue from a gas-cooker should not be extended through a wall. If a consumer insists on a flue, and there is no chimney available, break the same by a baffler or hood. But this will, in 90 days out of a 100, discharge the products in the room.

It will be agreed that it is not desirable to increase the amount of pull on the outlet of the gas-cooker above that necessary to just ventilate it—that is, to remove the products of combustion, &c. Any excess above the requirement results in lowering the efficiency of the cooker. It is desirable to remember this if an extension of the flue to a brick chimney is contemplated. We have already seen how powerful a chimney is as a ventilating agent, and how an extension of this character would affect the cooker. I remember reading in the Technical Press some time ago about experiments that were made with extensions of flues. Whereas with a 2-ft. vertical flue pipe a velocity of 106 ft. per minute was obtained, by increasing the length to 4 ft., 150 ft. velocity was recorded; and with a 6 ft. extension, it was increased to 178 ft. per minute. In these circumstances, and so as to secure good results, there must be a break in the extension as near as possible to the cooker.

Ventilation is a science that should be studied by all in the industry. It is closely coupled with heating. They are two distinct processes; but each is at the same time the cause and effect of the other. It would not be possible to deal with either alone. There is no need to employ mechanical arrangements. Nothing is better than a natural system; and this is always in operation. It is essential to the success of a natural system that both the outlet and inlet ventilators be of the correct constructions and skilfully applied. Where this is not observed, failure will ensue.

DISCUSSION.

The PRESIDENT said a large proportion of gas made and sold was used for cookers. Gas-cookers had many great advantages, and yet they had some drawbacks. Mr. Heathcote had analyzed some of the latter, and had suggested improvements which might be made. He had mentioned surface combustion, and asked whether they should not adopt this in place of the boiling rings. There was one disadvantage about surface combustion. They could not get it until the surface was red hot; and they could not obtain this without considerable expenditure of boiling heat. It would be easier to apply in anything like continuous work than in the occasional use for water boiling. In regard to the tests of the grillers, he was afraid the efficiencies were rather on the low side, because water was not a good absorbent of heat.

Mr. HEATHCOTE said he fully agreed that there were weaknesses in the idea. It was necessary to get in practice a very high temperature. The point he raised was that this was a possible improvement. He did not lay down any dogmatic assertion on the point; he threw it out rather as a feeler. In regard to the grillers, he had tested with a crude calorimeter. The sides and bottom of the cooker were bright, and the top was black, with a matt finish. He painted the top black, with a matt finish, so that it would retain all the heat possible.

Mr. C. D. CAWTHRA (Halifax) said what the housewife wanted was a cooker which would brown her Yorkshire pudding and bake her bread. This was her test of efficiency. In a case which had come under his own notice, it had struck him as peculiar that a cooker of more modern design in a house should give the user difficulties which a former, and older designed, cooker had not created. Investigating,

* Mr. F. S. Larkin's paper before the London and Southern District Junior Gas Association—see "JOURNAL," Dec. 1 last, pp. 520-23.

he had discovered a very simple remedy for the trouble. He found that, by lifting the tin in the bottom of the cooker and preventing the ingress of too much air, they obtained a much greater efficiency. He was afraid that practical efficiency was quite often sacrificed in gaining theoretical efficiency. A very efficient, but slow, boiling ring was no good to the man who had to shave in a hurry in the morning. He was not very particular about the quantity of gas consumed if he got his water boiled quickly.

Mr. HEATHCOTE said Mr. Cawthra had emphasized a number of the points which he had himself brought forward.

Mr. A. COE (Elland) said he would like specially to welcome the introduction in the notice of the meeting of a summary of the main points of the prospective address. He had, on seeing the nature of the address, looked up a few particulars of historical interest, as showing the apathy of manufacturers in regard to the practical needs in gas appliances. Anybody who looked up the experiments of Mr. Travers, in 1880, on the thermal power of gas-heating apparatus, would find them of considerable interest, and would see that they entirely endorsed the results of Mr. Heathcote's experiments with his small simmering burner as for a large burner in relative efficiencies. Within certain limits, it was proved by the experiments that the smaller the ring the greater the efficiency. There was some very interesting work by Mr. Thomas Fletcher on this subject. He asked whether Mr. Heathcote had tried any experiments with solid-flame burners.

Mr. HEATHCOTE said he was not sure that his own No. 1 burner would not be similar in being a solid-flame burner. Or perhaps Mr. Coe meant a complete flame right through. His own was perhaps more of a mushroom form. He had not tested with the fully solid flame burner.

Mr. COE said he considered the ideal flame was one which, when the vessel was placed upon it, did not allow interference with the inner cone. The inner cone remained exactly the same height as before the vessel was placed on the ring; but the outer cone lengthened and spread along the bottom of the appliance.

Mr. HEATHCOTE said his own point was that when the amount of gas was increased and the flame lengthened, the travel was reduced proportionately, and that was where they got their losses. That was borne out by the tests he had made. It was not a question of design in boiling burners. His own view was that they should break away from the old designs altogether. Failing that, let them increase their efficiency by absolute flame contact. He did not think they could get absolute flame contact with flat-bottomed utensils, whatever form of ring-burner they got.

Mr. COE said what he wanted to emphasize was that equal attention should be paid to obtaining flame contact and at the same time to getting the maximum amount of air required for completing the combustion of the gas as primary air, so that they got time contact rather than impact. To get the maximum efficiency from the gas they must have absolute combustion first.

The PRESIDENT remarked that on a surface combustion boiler it was found that there was no scale formed. The solids in the water formed as a sludge; and this looked, on the surface, as though they obtained absolutely the heat radiating right through the metal, although this did not seem theoretically possible.

Mr F. FIRTH (Leeds) said they must all agree that the time factor was of the utmost importance in dealing with the public. Other things being equal, it was a case of getting the number of B.Th.U. past the nozzle. He had found that in the ordinary burner a point was reached when no more gas could effectively be burned, because of the limitations of aëration. Experiments had been carried out; and it had been found that by diluting the gas prior to its being supplied to the burner, the number of B.Th.U. that could effectively be consumed in a given time was increased materially—*i.e.*, the boiling time was reduced.

The PRESIDENT remarked that they were limited by the primary air they could draw in.

Mr. FIRTH said primary air was the whole thing from beginning to end. If they could get just sufficient, so that they did not get lighting-back, they could obtain the maximum efficiency.

Mr. HEATHCOTE said to his mind there were only two ways of getting that. If they were going to increase the gas, they would have to increase the combustion. The alternative was low-grade gas.

Mr. FIRTH said it would have to be partially aërated before the point of combustion.

Mr. HEATHCOTE said he had tested only with a fairly good average gas, and not with low-grade gas. If it could be demonstrated that they could do what Mr. Firth suggested, they would get more towards their ultimate object of increasing the efficiency of the utensil.

Mr. H. RHODES (Bradford) said when they called on the people at the house, they wanted to know how quickly the gas appliance could do what was needed. This amounted to how much gas was burned in boiling the utensil properly. One factor was that they would have to work at higher pressures than in former times. The lower the grade of gas the more pressure would be needed. If the calorific value of the gas were reduced, they must get the quantity another way. The average user demanded a quick service. On the subject of ventilation and the down-draught, he quite agreed with Mr. Heathcote that it was not advisable to run a pipe through the wall, but could not agree that there was no cowl which would prevent trouble better than the conical hood. He had himself provided cowls which minimized the trouble to some extent; but they were bound to heat to counteract the cold action of the great amount of air. The conical hood was very fine; but he believed there were other methods better. If they were going to use low-grade gas in the future, they must have more volume through in equal time to serve the purpose.

Mr. HEATHCOTE said, on the question of hoods and flues, there was no point on which he was more stubborn or more firmly convinced. He was afraid nothing would convince him that any cowl could cure the trouble, though he did not deny that it might minimize it. Much depended on what the original fault was. He based his view on the action of the wind. Syphonage was the biggest trouble in all ventilating questions. He did not think they could go into one house in a hundred where they had sufficient provision for fresh air inlets. The builders all seemed to rely on the chimney, where the passing of the wind caused suction outwards.

Mr. RHODES said they rarely found a house to-day which was bottle tight. Most of them had plenty of crevices for the inlet of fresh air. In a boiler he had in mind, there was perfect combustion; and, by the use of a cowl, he prevented the flow of secondary air which was acting as a cooler on the boiler by retarding the flue.

Mr. S. H. PACKER (Bradford) said he was entirely in agreement with Mr. Cawthra and other speakers in the view that the greatest efficiency was found in the test of the service they gave to the public. Certainly let them have all possible scientific efficiency; but they must give practical service and convenience to the public. They all, perhaps, had some sort of a dream of what the perfect gas-cooker should be. Personally, he would like to see a cooker embodying four main points: First, he would have it raised from the floor, for hygienic reasons. Secondly, he would like an arrangement to be made whereby the door of the cooker should be transparent, so that the user could see exactly how the articles in the oven were going on. He thought it should be possible by the use of some such substance as the pyrax ware. Thirdly, it ought to be possible to utilize the waste heat from the oven and bring it above to the hot plate of the cooker for heating plates, &c. Lastly, cookers could be made very much lighter. They had seen, at one time or another, designs of some American ranges, which seemed to him to be far superior to those of this country. Some of them had a bye-pass arrangement which he had not heard of in connection with any British cooker. They could surely have a lighter structure, brighter parts, and more white enamel. With regard to standardization, the idea was an excellent one so far as concerned cookers purely for hiring. It should be useful if hiring was going to become general, as it was before the war. If people were going to prefer to buy outright or on the hire-purchase system, he was against standardization. If customers were going to buy, the seller must not tell them what they had to have. If they restricted designs to a few, they were creating a great power against increased sales. The point in selling was to give the public plenty of variety, so that they could obtain what they considered they wanted.

Mr. P. M'NAB (Low Moor) asked if Mr. Heathcote had ever seen a regenerative cooker on the market? Many years ago a paper was read before the Association on the subject of cookers, and the matter of the regenerative oven was brought up. He had asked them if it was not possible to utilize the waste heat and make a regenerative cooker. Soon afterwards he received a circular from a firm offering a trial of such a cooker. It might be interesting to know whether the thing had been taken up at all.

Mr. HEATHCOTE said he must say that he had not seen a cooker of that kind, though he did not say there had not been one on the market. The principle, of course, was not new—it was merely a question of the adaptation of the principle to gas-cookers.

Mr. F. CLEGG (Huddersfield) asked, in regard to restricting the products of combustion, if Mr. Heathcote had put this plan into operation to any material extent? Some years ago he saw an oven in regard to which complaint had arisen through not having sufficient air inside it. If the air was reduced, it seemed to him that they merely accentuated trouble of this kind. He had never yet found a real solution of this problem. The answer of one man interested in cookers, whom he asked the question, was that the sides of the oven became so saturated with fats, &c., that the flames were smothered.

Mr. HEATHCOTE said the whole trouble was insufficient ventilation. If the oven was too much ventilated, there was too much cooling. The cause of smothering of the flames was insufficient ventilation. They must allow just sufficient air for proper ventilation and give sufficient secondary air for combustion. He had known gas-fitters, when they had a complaint, simply rimer out the nozzle to get more gas. Many cookers were so proportioned as to allow only a certain amount of gas to pass through efficiently. If this amount were increased, it would be at the expense of ventilation.

Mr. MOSGROVE (Sheffield), in moving a vote of thanks to Mr. Heathcote, said the address and the points raised in the discussion were of great importance from all points of view, but particularly from the point of view of efficient service to the consumer. This was one of the main factors to salesmen; and it reacted right through the industry from the fitter to the manufacturer of the appliances and the makers of the gas. The better the service that was given, the more business would they get and the greater would be the use of gas.

Mr. H. WILDE (Bradford), in seconding, said if they were going to have on the market gas-cookers and hot plates, customers were going to ask how long would it take so-and-so to boil or to cook in the oven; and the salesman must be able to tell them. If they said it would take ten minutes to boil a small quantity of water, the people would say it was too long a time, and would look for some other method of heating. If the salesman could show that the gas appliance would act quickly and well, the customer would not worry about it, even if a little more gas had to be consumed.

Mr. HEATHCOTE, in response, said he wished to pay tribute to Mr. M'Lusky, the Halifax gas engineer, who had given him every facility for carrying out his tests.

The thanks of the meeting were also awarded to Mr. M'Lusky and the Halifax Gas Committee for the use of the showrooms for the meeting, and for their hospitality in providing tea.

RETORTS FOR LOW-TEMPERATURE COAL CARBONIZATION.

In the course of a lecture which he delivered to the members of the Bradford Institution of Engineers, Mr. THOMAS M. DAVIDSON explained at length the type of retort adopted for their process by Low-Temperature Carbonization, Ltd. By way of preface, he remarked that the manufacture of a domestic fuel from bituminous coal which will abolish smoke, and at the same time

save to the nation a great wealth of bye-products for which we are now sending our money abroad and losing on a disparaging exchange, is a project of the first magnitude. The Low-Temperature Carbonization Company have directed their energies to the domestic fire as the greatest sinner in the "Kingdom of Squandermania." They propose to concentrate upon the domestic grate first; but, of course, no one can foretell what the ultimate limits of low-temperature carbonization will be. He does not believe that any harm can result to the town gas industry by the inevitable advancement of low-temperature carbonization. The gas-works could always arrange to purchase the rich surplus gas from any low-temperature plant within their area, with advantage to themselves. Nor does the scheme enter into competition, in any respect, with the metallurgical coking industry. There is room for all.

After dealing with the coalite, tar, and gas produced, Mr. Davidson went on to say that the coal used in the process so far is a bituminous slack, which is washed, elevated, and conveyed into individual retort-hoppers, made to hold an exact retort charge. The charge remains in the hopper until the previous charge in the retort has carbonized; and during this period it collects an appreciable amount of heat from the top of the retort, and is consequently less likely to injure the walls of the retort when charged. Between the hopper and the retort is a rotary door which, when open, allows the coal to fall gently into the retort. At the bottom of the retort there is another rotary door for discharging the coalite. Below this bottom door there is yet another gas-tight chamber into which the coalite is admitted when carbonized; and in this chamber it remains until the succeeding retort charge is ready to come down, when the coke-door—which is a vertical door on the coke-bench—is opened, and the original charge, now cool enough to prevent oxidization when it is brought into the atmosphere, is taken out. The heat given-up by the charge during this cooling period is utilized along with the spent gases for generating steam in the jackets of the cooling chambers.

The idea of keeping the coalite within the air-tight chamber until it is defired, is, of course, to keep it out of the air until it is cooled to below its ignition-point, and so prevent loss of its volatiles and its deterioration by burning. In all previous attempts to cool coalite, its value suffered by even short periods of exposure, when it invariably burst into a vast sheet of flame. Cooling by steam was also injurious to its value, and changed the colour of the coalite from carbon to silver grey. The retorting system is therefore air-tight from the top or charging-door to the coke-door, from which the coke comes out at about 160° C.; while the bottom retort-door, situated midway between the two, need not necessarily be gas-tight.

The coke-chambers below the retorts are divided from each other by water-jackets with great heating surface exposed on the one side to the heat of the coalite and on the other to the spent flue gases on their passage down from the retorts above. Each jacket is provided with a partition in the centre to cause circulation of water. These jackets are tested to withstand 100 lbs. pressure per square inch; but as the steam is merely required for distilling the tar and manufacturing producer gas, it is not intended to work them at more than 5 lbs. pressure. The spent gases come into contact with the heating surface at about 300° C., and leave at about 130° C. The amount of water evaporated per ton of coal carbonized has not yet been ascertained, owing to the fact that ten new ovens are heating-up, and will shortly be brought into operation along with the existing ones.

The Low-Temperature Carbonization Company's ovens are heated by gas, and are so arranged that either their own rich gas or producer gas can be used for the purpose. The burner-flues are horizontally situated one above another between the retorts; the spent gases passing downwards at the end of each horizontal journey into the similar flue below, and being regenerated at each downward passage by supplementary burners until they reach the bottom of the retort, when they enter the recuperators situated on either side of the battery. They then pass upwards and downwards through the recuperators, counterflow to the primary air supply. The air by this means is pre-heated for the burners. The spent gases finally pass down between the water-jackets to the main flue, having parted with most of their heat prior to leaving the battery. No heat of any consequence is lost at the sides of the battery; the walls being quite cool to the touch. The primary air is admitted low down and carried up between the outside wall and the recuperator setting in the first instance, and gradually works its way through the recuperators towards the retorts, which are situated midway between the two recuperators. Air and gas is thus supplied to the battery from either side. Part of the heat radiated from the top of the battery is picked up by the coal in the hoppers. The real efficiency figure of heat transmission to the retorts has not yet been ascertained; but calculating by the drop in temperature of the waste gases, and other losses, it is estimated to be over 75 p.ct. To express it in relation to the ton of coal carbonized, the amount of coal destroyed to generate sufficient heat to carbonize a ton of coal would be about 10 p.ct., or a little less than 2 cwt. of coal or coke per ton.

The novel feature of the process lies in the retort itself. There are many mechanical devices patented for the low-temperature carbonization of coal; but engineers acquainted with the behaviour of iron and steel under a continuous red heat are reluctant to employ either of these for ovens or mechanical devices even under so low a temperature as 550° C.—especially if any mechanical function is demanded of them under this heat. Mild steel can perform wonderful contortions in a few weeks by expansion and growth; and cast iron, while decidedly better, begins to grow steadily after a week or two under heat. He could give an instance of an ordinary cast-iron vessel, 7 ft. high, which, under a temperature of 600° C., grew a little more than 1½ in. in height in three months. Growth sets in soon after expansion has taken place, and never ceases until the "scabs" are perforated and the cast iron begins to waste away.

On the other hand, iron is the best conductor of heat—and consequently a temptation to engineers. Also, a gas-tight retort can be made of cast iron, while the employment of refractory material makes this ideal unachievable—at any rate, with the kind of bricks manufactured to-day. It is encouraging to note that great attention is being devoted to the improvement of refractory bricks by scientific men of undoubted qualifications. It cannot be said that the same attention is being devoted to the manufacture of iron with a similar use in view. The addition of a certain percentage of manganese to the cast iron obviates growth to a large extent; but it is difficult to get the right amount into the iron. Scientific research with a view to manufacturing an iron capable of withstanding a constant temperature of (say) 700° C., without growth or scabbing, is urgently needed.

The Low-Temperature Carbonization Company now have four varieties of cast iron under heat. These have been manufactured approximately to the author's specification; and their behaviour is being carefully noted. Mr. Davidson designed the retorts built by the Low-Temperature Carbonization Company at Barnsley; and although they are made of refractory material, they differ widely from any of the high-temperature retorts hitherto in use.

For low-temperature carbonization, it is important that there should be no leakage of rich gas from the retorts to the burner flues, because, if there is, the rich gas burns in the flues, and consequently raises the temperature and spoils everything. This leakage is of little consequence in high-temperature work, because if it increases the temperature it is so much the better from the gas-making or metallurgical coke point of view; but for low-temperature carbonizing it is fatal, as temperature is the controlling factor in the process. Since, therefore, a gas-tight retort of refractory material is impracticable, means had to be found to obviate this difficulty. On the burner side of the retort wall is the pull of the chimney, while on the other side there is—in ordinary vertical retorts—a pressure set up by gasification, more especially when the coal used is in the form of slack. This pressure on the inside, and the chimney pull on the other side, invariably result in leakage into the flues. It is true that a slight pull is ordinarily applied to the top of the retort by the exhauster; but this is only effective for a depth of somewhere about 9 in. into the charge.

In the case of the Low-Temperature Carbonization Company's retort, means were provided by which the pull of the exhausters could be made efficacious to all parts of the charge, so that a balance could be arranged between the pull of the exhausters on the one side of the wall, and that of the chimney on the other. This arrangement has been very satisfactory, and has prevented the leakage of rich gas into the flues, and enabled the burner attendant to control the temperature by his burners. To do this, the retort was made wider than any previously built by the Company. It was divided into three equal chambers, the two outside ones to contain coal, and the middle one a perforated gassing chamber open to the exhausters. This middle chamber was intended to function in three different ways:

1.—To enable the pull of the exhausters to apply throughout the full depth and breadth of the charge with equal effect to all parts.

2.—To cause the gas to travel towards the central chamber, so that the heat from the walls would be attracted in the same direction; the gases liberating their heat first to the uncarbonized coal and afterwards to the walls of the middle chamber.

3.—To prevent the gases coming into contact with incandescent coke as far as possible, and thus save cracking and prevent the gases carrying away heat.

The result is that the temperature of the gases leaving the retort is lowered, while the tar yield is correspondingly higher per ton of coal; also, the period of carbonizing a given charge is reduced—or, rather, a given charge can be carbonized in the same period at a reduced temperature.

Although there are numerous varieties of low-temperature retorts patented, the methods can be divided under two headings—namely, continuous and intermittent. Each method claims distinct advantages. For the continuous process, it has always been claimed that there is conservation of heat, as it is said that the retort is not opened-up for charging or discharging, and consequently there is no loss either of heat or gas during these periods, as is the case with the intermittent retorts; while the intermittent retort justly claims—at any rate, in so far as it is used for low temperature—to make a better coke with less breeze, because the charge is stationary and undisturbed during the carbonizing period. The Low-Temperature Carbonization Company's retort can claim both these advantages, since the charge is stationary and undisturbed during the period of carbonizing, and the oven is not opened-up for discharging.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Gas Quality during the Coal Strike.

SIR,—I did not so soon expect confirmation from official sources of the suggestion made in your issue of the 15th ult. of the damaging effect on the gas industry of the Order by which gas was singled-out for special treatment during the recent coal strike, by reducing its quality to 450 B.Th.U.

From your "Parliamentary Intelligence," it now appears that dissatisfaction with gas supply has again been engendered in London by foisting on the public a quality for which the consuming appliances, and perhaps the distributing system, are unsuited.

Was the advice upon which the official attitude was based that of a Committee or of an individual? And if either were consulted in the matter, is it not surely time that the fact was disclosed and the reasons given for their, or his, extraordinary and damaging action?

South Metropolitan Gas Company,
Old Kent Road, S.E., Jan. 3, 1921.

CHARLES CARPENTER.

The Romance of the Gas Industry.

SIR,—It was with feelings of great pleasure that I read in the "JOURNAL" of Dec. 22 [p. 690] Mr. D. Milne Watson's little poetic outburst as to the romance of our industry. The words, "The gas industry was nothing to be ashamed of, but was a thing to be worked and fought for. Talk of the romance of other industries—why, the romance of the gas industry was greater than them all," would form, Mr. Editor, a suitable motto for the first page of each issue of the "JOURNAL." There are times when a mood of pessimism comes over even the most enthusiastic gas (or other) worker—times when the humdrum nature of his duties presses heavily upon him, making him inwardly exclaim, "What cruel fate has condemned me to a life like this!" At such seasons, the reading of the motto would act as a tonic and inspiration, leading to increased effort and hopefulness, and to the realization of the great truth that, in the steady and conscientious performance of duty, touched with idealism, there is to be found the highest and most lasting happiness. "Blessed be drudgery!"

I remember, when a youth of 23 or so (an age when most young men experience a period of discontent, whatever the calling in life they have espoused), writing to an old lady of literary attainments whose acquaintance I had made, and opening my heart to her on the prosaic character of my duties, and lamenting the fact that, while my mental bias was towards poetry and meditative literature, I was doomed to a high-legged stool in a dismal office, and to the wearying of my brain over figures and book-keeping. In her reply, she struck the same note that Mr. Milne Watson sounded at the National Gas Council meeting:

> My dear young Friend,—Your letter touches and pleases me. . . . I should certainly advise you to stick to your business. It is every man's duty (and every woman's, too, for that matter) to earn enough to maintain himself as soon as he is full grown. In so far as poetry stands as a hindrance to this, poetry must give way, however strongly the inclination may assert itself. . . . Yes, stick to your gas work; and do you not see how the poetry that, so far as true, must always remain latent in you, will find a glorious sphere for itself even in meditating on gas? Think of the depths of poetry which are involved in what science has taught us about gas! Consider, too, that, from such an unpromising looking thing as coal, the beautiful aniline dyes are obtained. Why, one might say that the colours of the countless flowers that bedecked this old land of ours untold ages ago have been stored-up in the black and "prosaic" mineral to be released by the magic wand of gas!

I have treasured this letter, so sane and inspiriting. Many a time have I perused it during the quarter-century that has intervened, and never has it failed to yield me solace and encouragement. Let me, as one who may consider himself a veteran, offer this little bit of advice to young men in the gas industry: Copy out the full text of Mr. Watson's words, and carry them about in your pocket-book. They will act as a talisman when discontent—divine or otherwise—takes possession of the mind.

Edinburgh, Jan. 3, 1921.

A. CANNING WILLIAMS.

Gas-Furnaces.

SIR,—I shall esteem it a favour if you will grant me space in the columns of the "JOURNAL" to make a reply to the comments of Mr. W. R. Twigg upon the paper recently read by me before the Scottish Junior Gas Association (Western District).

Mr. Twigg has put forward some very interesting data concerning the relative advantages of using the various types of furnaces, and he goes so far as to suggest that what I propose as classifications should not be accepted. I am afraid Mr. Twigg had been reading between the lines when he arrived at this decision; for if he will read again he will notice that what I do say is: "Gas-furnaces may be grouped under three main headings;" and the statement in my opinion gives the impression that such headings may be extended or subdivided to cover every type of gas-furnace, irrespective of make or design. In any case, Mr. Twigg, being dissatisfied with my contention, has endeavoured to create suitable headings; and it may be left to those interested to adopt his classifications if they so desire.

The next point dealt with is that of the relative advantages due to the system of regeneration adopted in any particular design of furnace, but with the qualification (quoting his own words) "provided the construction of the furnace and the relationship of the gas and air are reasonably correct."

Mr. Twigg will agree that such a provision is the bugbear of every gas-furnace; and until both gas and air supplies are brought under automatic control, to ensure a constant ratio of mixture without depending on the human element, we may expect varying efficiencies and temperatures, irrespective of the design of furnace or system used to introduce either.

Mr. Twigg also finds it difficult to get into line with my ideas regarding the assertion that natural-draught furnaces should be used for all temperatures up to 1000° C.; nor can he possibly accept such a suggestion simply because such furnaces are only semi-regenerative, and do not compare so favourably with the truly regenerative, which he asserts I would exclude.

I have never overlooked the fact that furnaces in which the air for combustion is introduced under pressure by means of a fan—be they recuperative or regenerative—are as suitable as, and more economical than, natural draught. Nor can I overlook the fact that natural-draught furnaces can be used for such temperatures. They require less attention, are easily controlled, and are only limited in their adoption according to the output required from them. Thus my statement need not be taken so literally as Mr. Twigg asserts.

Regarding the comparative data including the other details, these are useful adjuncts to the subject-matter of my paper; and while it may be within the rights of Mr. Twigg to use the specific names of makers for comparisons, I purposely refrained from doing so, and the reason I think will be obvious.

Kelvinbridge, Glasgow, Dec. 30, 1920.

J. M'ISAAC.

Drying Sulphate of Ammonia.

SIR,—In your issue of Dec. 15 [p. 638], I note, in connection with the report of my lecture on "Centrifugal Extractors for Drying Sulphate of Ammonia," you report I stated that "'bottom discharge' hydro-extractors should preferably be of the 'suspended,' or 'Weston,' type, rather than the under-driven type." This is an unfortunate statement, since the "suspended" and "Weston" types are different; the "suspended" type being an under-driven, and the "Weston" type over-driven.

As I was careful to explain in my lecture, either of these is commonly used in connection with the drying of sulphate of ammonia; and I endeavoured to show the good features of each type of machine, and, finally, stated that each had its advocates, without indicating my own preference.

I shall be glad if you will correct the above in your next issue. I am very pleased with the rest of your report.

Central Iron-Works, Huddersfield, Dec. 24, 1920.

F. J. BROADBENT.

Gas Accounts and the Therm Charge.

SIR,—With "Provincial," I regret so little advantage has been taken of your offer, when you freely opened your correspondence columns for the purpose of allowing discussion of Mr. Topley's model account. The holiday intervening may have been the reason. One clerical error I would point out in my previous communication [p. 708]—viz., the title over the right-hand column of the specimen meter-index reading card should have been "Declared Calorific Value," instead of "British Thermal Units." This is obvious.

Since writing you, I have, through the courtesy of Mr. F. M'Leod (the General Manager of the South Metropolitan Gas Company) received specimen copies of the accounts that the Company propose to render to their consumers this quarter, together with the meter-index reading card at present in use, giving the consumption in cubic feet translated into therms, likewise calculation tables to enable the meter readers and office staff to see at a glance the equivalents of the two terms. The account giving therms only is quite good, as that is all the consumers are purchasing, and it is necessary to familiarize them with the new phrase and cultivate the recognition of the heat they are purchasing. But the Company go one better, for on the back of the account is fully set-out in simple form all the information necessary to enable the consumer to check his account from the meter-dials as before. This information I had put on the face of my account. I think theirs the better method.

Mr. Topley will, I am sure, be glad to see these specimens in print, as they will answer the queries he raised, and give him all the information he sought. It now only remains for him to come into line and drop the decimal point in favour of the ¼d. as the multiple for the increase and decrease in the therm charge above or below the standard price, as so many companies have done when lodging their applications at the Board of Trade under the Gas Regulation Act.

There are other questions besides the above-mentioned in the Act that require discussing. In fact, the Act is full of pitfalls for the unwary; and much good could be done if District Junior Associations would give an evening for "talking" over the Act on the lines of Mr. Langlands' (Glasgow) excellent paper. I have already brought the matter before the London and Southern District Junior Association, and trust an evening will be set apart for it.

Dulwich, S.E., Dec. 30, 1920.

W. J. LIBERTY.

P.S.—Since writing, I have received your current issue, with the South Metropolitan Gas Company's specimen account, &c., printed therein.

Electrical Breakdown at Stockport.—An accident at the Stockport electricity works last Thursday afternoon resulted in a stoppage of the tramway service and of the factories using electric current. Three small generators were brought into action later in the afternoon; but only a limited supply of current could be given, and great inconvenience was caused in the town. The enforced stoppage over the week-end of the works using current affected some 10,000 people.

French Petrol Tax.—It is stated by the financial correspondent of the "Daily Telegraph" that a Bill has been laid on the table of the French Chamber by an important group of Deputies, headed by M. Bouilloux-Lafont, to suppress the tax of 20 frs. per 100 litres (22 gallons) on petrol, mineral spirits, benzole, and other similar oils. M. Bouilloux-Lafont explains that this impost of 20 frs. would correspond with equal heating power to a duty of 175 frs. per ton of coal.

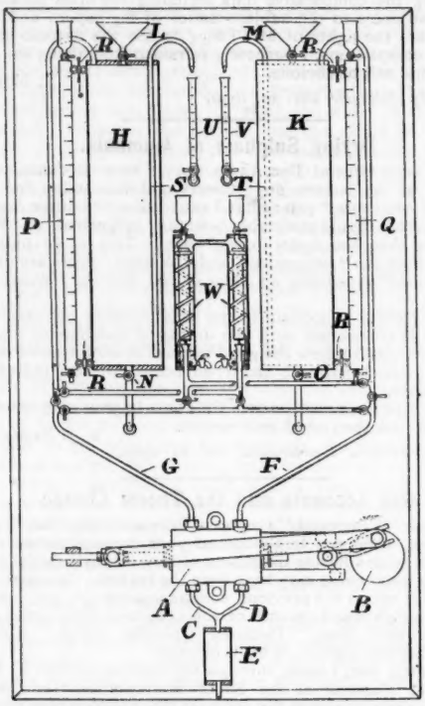
REGISTER OF PATENTS.

Continuous Analysis of Gases.—No. 153,637.

WOLLASTON, T. R., of Manchester.

No. 18,280; July 23, 1919.

This invention relates to apparatus for the analysis of the gas from gas-producers, retorts, and the like, so as to determine the average percentage of one or more constituent gases over a long period and (or) simultaneously the percentage over any selected short period. It is applicable for the determination of any constituent gas capable of absorption—for example, carbon dioxide by caustic potash solution, carbon monoxide by cuprous chloride solution, or oxygen by pyrogallol solution, but is hereafter described as if applied for the determination of CO_2.



Wollaston's Gas Analysis Apparatus.

The illustration is a front elevation of the apparatus. A is a double-acting piston pump operated from the crank shaft B, which is rotated—for example, by an electric motor or line shaft. C and D represent respectively suction connections with the pump at "front" and "back" ends through which the gas to be tested is drawn. These have a common connection with the source of gas through the filter E. F and G represent discharge conduits, respectively from the "front" and "back" ends, which convey the gas discharged to the top of the receivers H and K. Before starting to work, the receivers have been filled with non-absorbent liquid through the inlets L and M—residual liquid from previous operations having been previously discharged to waste through the taps N and O.

The receivers H and K have so far been described as if single vessels; but as shown and as adjuncts, there may be applied smaller tubes or columns P Q, of identical effective height and with communicating passages R at top and bottom, so that any level of liquid in (say) the receiver H is exactly reproduced in the tube or column P. These supplementary columns P and Q are not essential to the operation of the apparatus, but offer convenience of manipulation and are conducive to accurate readings.

The receivers H and K, or the columns P and Q, or both, are calibrated and graduated for indicating volumetric displacement.

S T are discharge pipes for conducting away the non-absorbent liquid as it is displaced by the incoming gas. These terminate in discharge orifices about the level of the top of the receivers H and K. They discharge into graduated burettes or test tubes U and V, so that the relative volumes of liquid displaced from H and K over any short period of time may be ascertained from the graduations on U and V.

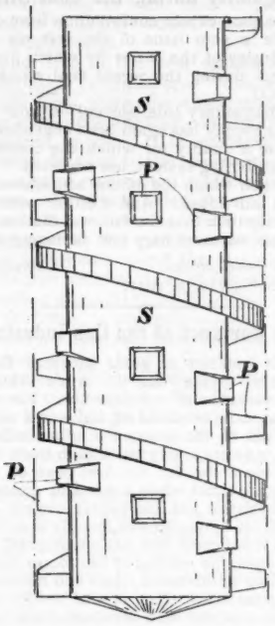
W is an absorber comprising two connected tubes with charging nozzles and taps, gas inlet and outlet ducts, and solid cores mounted thereon spirally wrapped with absorbent wicks which dip into absorbent liquid and are maintained in moistened condition by capillary effect. Gas may be passed through the spiral annular thoroughfares thus obtained in either direction. Certain hand-operated taps are provided to control the direction of flow.

Water-Heating Apparatus.—No. 154,080.

WILSON, C. L., and DAVIES, H., of Armley, Leeds.

No. 31,035; Dec. 11, 1919.

This invention relates to water-heating apparatus in which a spiral is placed in the flue through which the heated products of combustion flow to heat the water in the surrounding casing or reservoir—see patent No. 28,996 of 1911. The object is to construct the spiral from clay or porcelain, and to provide in connection with it protuberances or studs which will tend to break-up the gases and effect what may be termed a "turbulent" flow so as to cause the whole of the gases to come into contact with the water jacket, whereby the efficiency of the apparatus is increased.



Wilson's and Davies' Gas Water-Heater.

To carry the improvement into effect, the spiral S is arranged in the flue (shown by dot-and-dash lines) heated by a luminous burner. The spiral is "moderately compact as to its height," and "to obtain the maximum efficiency care must be taken that the area of the spiral passage is such that the flow of the heated gases will not be unduly impeded or baffled." If the spiral passage were unprovided with protuberances such as P, which will by preference also be arranged spirally, the tendency of the hottest gases would be to creep-up the centre of the spiral—that is, away from the edges—leaving the cooled gases to the outside. Therefore the spiral path or passage is broken up by the protuberances, and the gases are caused to flow upwards in the manner described as "turbulently."

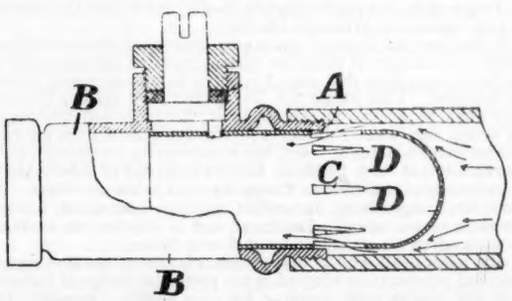
The patentees remark: "To decrease the length of the device the pitch may be lessened towards the top as shown, because the products of combustion, as they are cooled by contact with the water-jacket, contract in volume. This construction gives a compact and efficient spiral, which, combined with a suitable luminous flame burner, will give a high percentage of efficiency. We have constructed a water heater with a compact spiral and luminous flame burner burning about 40 c.ft. of gas per hour, the efficiency of which is as high as 95 p.ct. of the net heat of the gas consumed. The area of the spiral path will be varied to suit varying requirements and burner capacity; and it will be found that the turning-down of the flames will not cause the serious drop in efficiency which usually occurs in water-heating appliances."

Regulating the Gas Supply to Atmospheric Burners. No. 154,363.

YATES, H. JAMES, of Aston, M. HOWLETT & CO., LTD., of Birmingham, and DOLPHIN, J., of Harborne.

No. 21,952; Sept 6, 1919.

This invention has reference to means for so regulating the gas supply to atmospheric burners (particularly when used for heating purposes) as to prevent hissing or roaring at the nipple when the gas is burning—the invention being so constructed and arranged as to be readily adjustable to suit various pressures in the gas-main.



Yates, Howlett, and Dolphin's Atmospheric Gas-Burner.

A part sectional plan is given of an atmospheric gas-burner made according to patent No. 131,631, but with a hollow, piston-like, sliding,

perforated regulating valve constructed in accordance with the present invention.

The regulating valve is mounted in the inlet end A of the nipple body B, which forms the gas expansion chamber. The longitudinal slits C are, according to the present invention, made with inclined slides, as shown, which become gradually farther apart and the slits gradually wider towards the front end of the sleeve where they enter the tubular nipple body. By this arrangement, any particular longitudinal backward movement of the sleeve against the incoming gas entering in the direction indicated by the arrows to increase the effective area of the slits will enable the sleeve to pass a considerably larger volume of gas than would be possible with the same travel of the sleeve if the slits were made with parallel sides of the same narrow width throughout as is the narrow back end D of the tapered slits.

Thus the same tubular sleeve-like regulating valve made with the slits gradually widening towards the forward end, as illustrated, can be made to serve for passing any volume of gas required according to the number of atmospheric burners which the regulator is required to serve.

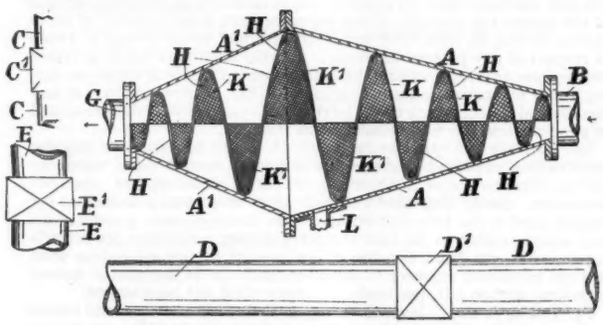
Purification of Gas.—No. 154,742.

HOLT, C. E., of Wilmslow, and BURGOYNE, J. S., of Woodley, near Stockport.

No. 23,167; Sept. 20, 1919.

This invention relates to the purification of gases containing naphthalene; and it has for object to provide means whereby the amount to be eventually carried forward by the gas "as a useful constituent," may be so regulated or adjusted as to "ensure an efficient content for enrichment of the gas, while removing any excess of this hydrocarbon which is otherwise likely to be deposited in pipes or other apparatus to a detrimental extent."

The patentees cause the crude gas to be brought into passing contact with a screen of wire gauze or equivalent surface, whereby a scrubbing action is produced. The meshes are of such texture as to prevent their being clogged with tarry matter, while permitting the formation of films of light oil due to the scrubbing action of the gas as it passes through the screens—the oily particles containing naphthalene being deposited. The heavier matter falling by gravity is removed, while the formation of fresh film on the screen results in the "adjustment of the content of naphthalene in the gas according to the temperature conditions," which it is preferred to be atmospheric or lower, so that further deposit is not likely to take place to any great extent in the service pipes.



Holt and Burgoyne's Gas Purification Plant.

A A¹ is a hollow vessel of truncated conical form, connected by flanges. It is in communication through the inlet pipe B with the pipe C—a branch pipe from the gas-main D, assumed to be in connection with the condenser pipes of a gas plant at one end, and at the other end with a scrubber-washer. A branch pipe E, from the main D (and at the opposite end) is assumed to be in connection with the outlet G.

A passage for the gas through the vessel is provided with a continuous screen arranged in helical form—that is to say, a frame of wire material H is bent into a helix of varying diameter, and along and about which is attached wire gauze or similar material K K¹, so that the gas has to pass through and along the gauze from end to end before escaping at the outlet.

Near the inlet, the mesh of the gauze is coarser than towards the central parts, which are increased in diameter so as to compensate for the reduction in the area of the openings, thus ensuring an even flow of gas. On the other hand, the mesh may gradually increase in coarseness towards the outlet end.

It is preferred to make the length of the part A greater than the length of the part A¹, so that the gas, on entering at B and being in its most impure condition, has a relatively longer period allowed for the scrubbing action at the gauzes prior to reaching the finest mesh, compared with the period between the latter condition and the outlet.

Valves are assumed to be situated at D¹, C¹, and E¹, for controlling the flow of the gas through the vessel relatively to the main D. L is an outlet for heavy tarry matter and sediment which collects at the lower part of the vessel—an outlet in connection with a tar-well.

Mouthpieces for Vertical Gas Retorts.—No. 154,758.

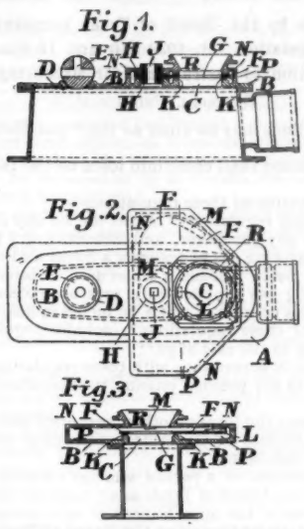
GOODALL, CLAYTON, & CO., LTD., of Hunslet, Leeds, PAYNE, C. R., of Huddersfield, and ARCHDALE, J. A., of Leeds.

No. 24,316; Oct. 6, 1919.

This invention has for its object, first, to provide for the charging of the retort without undue emission of smoke; secondly, to reduce to a minimum the working parts of the mouthpiece; and, thirdly, to prevent the damage ordinarily caused to the retort top by repeated impact of the heavy hinged lid upon the mouthpiece body.

Fig. 1 is a sectional elevation of the mouthpiece; fig. 2 is a plan; and fig. 3 a sectional elevation on the line X of fig. 2.

The mouthpiece is fitted with an elongated cover plate B having a charging hole C towards one end, and an ordinary inspection hole D with ball-valve E towards the opposite end. This hole is, in turn, fitted with, or closed by, a pivoted sector-shaped valve-plate F solid at one end and having at the other end an opening corresponding to the



Payne and Archdale's (Goodall, Clayton, and Co.) Vertical-Retort Mouthpieces.

charging hole. The valve plate has limited horizontal rotating movement about a vertical pivot-bearing, or the like H, and is controlled by a loose key lever inserted through the recess J in the hub of the valve plate—thus forming a hit-and-miss closure for the hole C. The hole has a vertical flange terminating in, and forming, a knife-edge bearing K for the plate F; and the latter is automatically tightened-down upon the bearing (when in the closed position) by raised wedges or inclined faces L on the upper face which engage with corresponding wedges M on the underside of an upper cover plate N. The latter is screwed-down over a laterally extended chamber P, provided over the charging end of the plate B, so as to provide clearance for the swing of the plate F. The plate N is formed with a hoppered inlet R, which is part and parcel of it, immediately over the hole C.

For inspection, the ball-valve E is operated in the ordinary way. To charge the retort, a key lever is inserted in the recess J and turned. This moves the plate F on its pivot-bearings and over the bearing K, disengaging the wedges L M, until the opening G registers with R and C as shown. Upon reversing the lever, the wedges again engage, automatically, and gradually force-down the plate on to the bearings, so that the hole C is covered by the solid portion and little, if any, smoke or gas can issue therefrom.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Dec. 30.]

Nos. 35,649 to 36,270.

BARRS, E.—"Low-temperature distillation." No. 35,748.

BARRS, E.—"Rabbles for low-temperature coal distillation, &c." No. 35,753.

BARRS, E.—"Coking discharged material from low-distillation apparatus." No. 36,129.

BARRS, E.—"Manufacture of briquettes." No. 36,130.

BOWKER, J. W.—"Wood-mantels, &c., for gas-stoves." No. 35,774.

BRADLEY, J. W.—"Incandescent gas-burners." No. 35,662.

DIXON, H. J.—"Gas-burners." No. 35,793.

DOMBROWSKI, D.—"Cardboard boxes for incandescent mantles." No. 35,683.

DUPLEXALITE CORPORATION.—"Illuminating devices." No. 35,721.

ETHERIDGE, J. D.—"Union joint for lead piping." No. 36,140.

GIBSON, R. K.—"Prepayment recording attachment for gas-meters." No. 35,651.

HEAYSMAN, D. T.—"Connection for connecting flexible tubes to gas-fittings, gas-rings, &c." No. 35,673.

HIGGINSON, G. S.—"Gas and oil vapour furnaces." No. 36,175.

HILL, J.—"Dry gas-meters." No. 36,162.

IRVING, R. F.—"Calorimeters." No. 35,716.

JOHNSON, J. F. W.—"Operating automatic gas-meters by means of tokens." No. 35,995.

MAZZA, E. N.—"Separation of gaseous mixtures." No. 35,862.

MEACHAM, B. E.—"Thermostatic fuel-regulating devices for gas-ovens." No. 36,105.

MIEVILLE, H. C.—"Fuel-control valve." No. 35,954.

PALMER, A. R., F. E. H., & PALMER & CO., F. & A.—See Dixon. No. 35,793.

PARKER, T. H.—"Gas-producers and carbonizers." No. 35,744.

PEARSE, W. F.—"Hydromain valves for coke-ovens, &c." No. 36,151.

ROUSE, E. E.—"Atmospheric burners." No. 35,708.

SEECK, T. M.—See Johnson. No. 35,995.

SMITH, E. W., & SMITH METERS, LTD.—"Glands and stuffing-boxes for dry gas-meters." No. 35,735.

STEWARD, H. C.—"Device for preventing glare of lamps, &c." No. 36,085.

THORPE, H. C.—See Irving. No. 35,716.

WEYMAN, J. E.—"Atmospheric burners." No. 35,671.

WILD, R. E.—"Electric gas-lighting devices." No. 35,675.

MISCELLANEOUS NEWS.

GAS-METER TESTING.

Regulations made by the Board of Trade pursuant to Section 12 of the Gas Regulation Act, 1920 (10 and 11 Geo. V., ch. 28) in Relation to Instruments for Measuring Gas.

GENERAL PROVISIONS.

1. These regulations may be cited as the "Gas-Meter Regulations, 1920."

2. These regulations shall come into force on the 1st day of March, 1921.

3. In the construction of these regulations—

"the date of these regulations" means the 1st day of March, 1921;

"meter" means any gas-meter, and includes every kind of machine used for measuring gas as between a buyer and seller of gas;

"high-pressure meter" means a meter used or intended to be used for measuring gas supplied at a pressure exceeding that which will balance a column of water 10 inches in height;

"requirements of these regulations" includes requirements of the Acts relating to the sale of gas;

"correct" means in accordance with these regulations;

"*in situ*" refers to any position outside the inspector's office or testing-rooms;

"authority" means the local or other authority which has jurisdiction under the Sale of Gas Acts in respect of the matters dealt with in any regulation.

4. On the appointment of a person who has obtained a certificate of qualification from the Board of Trade as an inspector by the authority, or on the termination of the appointment of an existing inspector, the authority shall give notice thereof to the Board of Trade.

5. Local standards which are provided by the authority shall be of material and form approved by the Board of Trade.

6. The inspector shall be provided by the authority with an adequate office, instrumental equipment, office fittings, and furniture to the satisfaction of the Board of Trade.

7. The authority shall cause the inspector to make an annual report in such form as may be approved from time to time by the Board of Trade. A copy of such annual report shall be sent to the Board of Trade by the authority not later than the 30th day of September in any year.

8. Inspectors shall conform to the instructions set out in the schedule to these regulations, with such modifications as may be made therein from time to time by the Board of Trade; and the authority shall not issue any instructions inconsistent therewith. It will be the duty of the authority to see that their inspectors act in compliance with such instructions.

9. Where, in the special circumstances of any case, it appears to the inspector to be impracticable to comply literally with any requirement of these regulations, he shall consult his authority therein, with the view of referring the matter to the Board of Trade; and the Board may, if they think fit, dispense with the observance of such requirement. The particulars of any such dispensation will be circulated to all testing authorities.

10. A meter not in accordance with the requirements of these regulations shall not be stamped.

EXAMINATION.

11. A meter presented for verification shall be complete in itself, and shall not bear a mark which might be mistaken for the inspector's stamp. This is not intended to prohibit the placing of a seal on the case enclosing any prepayment mechanism.

12. No meter shall be stamped which is not, in the opinion of the inspector, sufficiently strong to withstand the wear and tear of ordinary use.

13. No meter shall be stamped unless it be inscribed legibly with the following particulars:

a. The cubic capacity of the meter during one revolution or complete action of the meter.
b. The quantity per hour it is intended to measure.
c. The name of the maker, and the identification number.
d. The year of manufacture, and, in the case of repaired meters, the year of repair.
e. In the case of high-pressure meters, the fact that they are such, and the maximum pressure at which they are designed to work.

14. The identification number, the quantity per hour, maker's name, &c., must be on, or attached to, the index plate or front of case; and the inlet of the meter must be marked "Inlet."

15. On or attached to the dial-plate shall be marked the unit or measurement "Cubic Feet," or, in the case of meters intended for export, which are submitted for testing, such other unit of measurement as is involved.

16. Each registration dial-plate, circle, or shaft unit drum of a wet meter must be so marked with the number of units or tens or hundreds or thousands, &c., which it is intended to indicate, as to make it clear what quantity is represented by each division of the circle.

17. The inspector shall observe that the meter is provided with suitable seal ring or rings, securely fixed, in accordance with the stamping regulations. All seal rings should be attached in such a manner that they cannot be detached without breaking the seal. Any soldering* that may be necessary shall be done on the inner side of the ring.

18. A meter not fitted with a back-stop may be stamped, provided the inlet is plainly indicated, and the meter bears a badge marked "Without Back-stop."

VERIFICATION.

19. The following rules (A, B, C) shall be observed by the inspector in testing meters, in substitution for the rules prescribed in Section XIII. of the Sale of Gas Act, 1859:

(A) *Soundness.*—Meters shall be examined with closed outlets for external soundness or leakage under a pressure which will balance a column of water 5 in. high, or in the case of high-pressure meters under a pressure equal to one-and-a-quarter times the maximum pressure at which the meter is designed to work. If any escape be indicated, the meter shall not be stamped.

(B) *Unregistered Gas.*—Meters shall be fixed on a horizontal base, and tested for the registration of small quantities at a pressure which will balance a column of water 5 in. high, and with outlet checked and passing gas or air at the following rates:

Quantity of Gas per Hour which Meter is Intended to Measure.	*Rate per Hour at which Gas or Air is to be Allowed to Pass Out.*
Not exceeding 120 c.ft.	Not exceeding one-thirtieth part of the quantity per hour marked on the meter or 2 c.ft., whichever is the less. In no case shall the rate be less than ½ c.ft. per hour.
Exceeding 120 c.ft., but not exceeding 1000 c.ft.	Not exceeding one-sixtieth part of the quantity per hour marked on the meter or 6 c.ft., whichever is the less.
Exceeding 1000 c.ft., but not exceeding 2000 c.ft.	Not exceeding 10 c.ft.
Exceeding 2000 c.ft.	Not exceeding 15 c.ft.

In making this test, every meter shall be made to work through at least one revolution or complete action of the meter. Any meter found not to register under such conditions shall not be stamped.

(C) *Registration.*—The meter to be tested for percentage of error shall be fixed on a horizontal base, and shall be tested at a pressure which will balance a column of water 2 in. high at the inlet of the meter, and the outlet shall be checked until the meter is passing gas or air at the rate per hour corresponding with its indicated measuring capacity, or, alternatively, the maximum rate per hour at which the testing instruments available are capable of registering.

20. *Tolerance.*—A meter shall not be stamped which, when tested under these conditions, registers more than 2 p.ct. over or 3 p.ct. under the actual quantity passed. The water used in such test and the air of the room in which such testing is made shall be as near as practicable of the same temperature as the gas or air passed through the meter.

21. *Capacity.*—If, in the opinion of the inspector, the capacity per hour marked upon the meter is unduly high, he shall submit the meter to a further test under the same conditions as the above, except that the rate per hour shall be equal to 100 revolutions or complete actions of the measuring capacity of the meter, or such other number of revolutions as may be from time to time determined by the Board of Trade in respect of any pattern of meter. Should the meter when so tested not register correctly within the before-defined limits of error, or during either test cause undue oscillation of lights, or give evidence of any mechanical defect which could be reasonably and practically prevented in good meters, the meter shall not be stamped.

22. *Excessive Absorption of Pressure.*—If, in the course of testing for registration, as provided above, the inspector should have reason to believe that the meter is absorbing excessive pressure, and, upon examination, should find that the difference in pressure indicated by gauges fixed at the inlet and outlet of the meter exceeds 5-10ths of an inch water column in the case of meters having a capacity not exceeding 5000 c.ft. per hour, 8-10ths in the case of meters exceeding 5000 and not exceeding 20,000 c.ft. per hour, and 1 in. in the case of meters exceeding 20,000 c.ft. per hour, the meter shall not be stamped.

23. *Testing in situ.*—Inspectors may in their discretion test and stamp meters *in situ;* and in such cases the pressure at which the soundness and the registration tests are made may be the district pressure available in the place where the meter is fixed, and which is normal to the working of such meter. In cases of testing *in situ* the inspector shall be entitled to charge reasonable expenses in addition to the statutory fee for examination, comparison, and testing.

24. *Special Index Testing.*—An inspector may, by agreement or on request, test the index of a meter; and the charge to be made for such special examination shall be as under:

For meters with a measuring capacity up to 200 c.ft. per hour	4s. 0d.
For meters with a measuring capacity above 200 and not exceeding 600 c.ft. per hour	7 6
For meters with a measuring capacity above 600 c.ft. per hour	10 0

25. *Disputed Meters.*—The inspector shall first ascertain the readings of the index. He shall then apply the prescribed tests; the test for accuracy being repeated one or more times, and the temperature conditions particularly noted.

26. *Prepayment Meters.*—A prepayment meter shall be examined, verified, and stamped in the same manner as a non-prepayment meter. An inspector is not required to test the accuracy of the prepayment mechanism.

STAMPING.

27. Every meter shall be stamped in such manner as in the opinion of the Board of Trade will best prevent any tampering with, or alteration of, the mechanism of the meter. In general a meter shall be stamped in the following manner:

(1) On the exterior of the index-box or cover of wet meters in such a position that the box cannot be opened without the seal being broken.
(2) On such conspicuous place or places on the body of the meter as may appear to be necessary to prevent the opening of the meter for adjustment without the breaking of a seal.

28. The inspector's stamp (which is of the uniform design) issued by the Board of Trade shall have in addition the number distinguishing the district and the year of stamping.

Signed, by Order of the Board of Trade, the 16th day of December, 1920.

H. A. PAYNE, Secretary to the Board of Trade.

* The component parts of a suitable alloy as used in the Standards Department is as follows: Bismuth, 8 parts; tin, 4 parts; lead, 4 parts.

SCHEDULE.

INSTRUCTIONS TO INSPECTORS OF METERS.

GENERAL.

1. An inspector is not required personally to test every meter presented for verification; but he must supervise, and he will be held responsible for, all testing made under his directions.

2. Any meter as to which a certificate has been given by the Board of Trade under section 6 of the Weights and Measures Act, 1904, must satisfy the requirements of any supplementary memorandum that may be issued by the Board of Trade in connection with the certificate granted to the particular pattern in question. A high-pressure meter should not be accepted for verification until a pattern thereof has been granted a certificate under section 6 of the Weights and Measures Act, 1904.

3. An inspector shall take in respect of the examination, comparison, and testing (with or without stamping) of meters, the fees prescribed.*

4. In addition to the Sale of Gas Act, 1859, the Gas Regulation Act, 1920, and the Regulations thereunder, the inspector must make himself familiar with the provisions of certain other Acts which are enumerated below, so far as they may have application to his duties.

Weights and Measures Act, 1878, sections 37 and 41.
" " 1889, sections 15.
" " 1904, sections 5 and 6.

5. In testing a meter *in situ*, a 20-light standard meter may be used for testing any meter from 20 lights to 100 lights. A large standard of (nominally) 100 lights is necessary for testing larger meters.

6. The percentage of error of a meter is ascertained by calculating the ratio per cent. which the error bears to the reading of the standard gasholder. Thus:

Meter Reading. Holder Reading.
2·0 c.ft. .. 1·97 c.ft.
1·97 : 0·03 :: 100 : x.

gives $x = 1{\cdot}52$, the required percentage of error.

7. A decision given by an inspector regarding the state of a meter he has tested shall only apply to the date on which the test was made.

8. The inspector shall be provided with such implements as may be necessary for affixing the local verification stamp, the design and number of which are furnished by the Board of Trade.

9. For use in the verification of meters, and the general duties of his office, the inspector should, as a minimum, be provided with the following equipment:

One twenty-light (120 c.ft. per hour) standard test meter.
One proving table.
Suitable gauges.
One burning-off lamp.
Tools—including pliers, spirit level, &c.

10. The minimum amount of floor-space of any inspector's office and testing room should be approximately 500 sq. ft. The testing room, if specially built for gas-meter testing purposes, might be provided with movable top northern lights open to the sky.

11. The inspector shall keep suitable books as follows:

Meter Register.
Daybook, or "Working Diary."
Ledger.
Certificate of Verification Book.
Cash Book.
Receipt and Delivery Book.
Record of Standards Book.

12. No inspector shall wilfully disclose or cause to be disclosed, directly or indirectly, the secrets of the business of any manufacturer or trader, of which secrets the inspector has become possessed in the performance of his duties, or otherwise betray the confidence of his office.

13. In no case shall the inspector accept any gratuity or reward from any manufacturer or trader. Inspectors are prohibited from having any pecuniary interest in any firm making, repairing, or selling gas meters.

CUSTODY OF STANDARDS AND EQUIPMENT.

14. In order to prevent improper and unauthorized use of stamps of verification, an inspector must—

(*a*) Keep an accurate inventory of such stamps;
(*b*) Keep all stamps under lock and key when not actually in use;
(*c*) Report immediately to his authority the loss of any stamp.

15. The inspector must cause all the local standards provided for his use to be duly verified or re-verified in accordance with the provisions of sections 37 and 41 of the Weights and Measures Act, 1878, and section 15 of the Weights and Measures Act, 1889. Where local standards are re-verified locally, under the provisions of section 41 of the Act of 1878, the limits of error permitted are those specified by Order in Council.†

16. The bell of the standard holder, if fitted with a cycloid, should be raised to the top once a week in order to see that the cycloid cord and that suspending the bell are in proper alignment. The bell should then show a constant pressure on the gauge throughout its descent, the exit cock being open to the atmosphere.

The water in the tank of the holder should be changed at least once in three months. Should the water have a tendency to become offensive, it should be changed much more frequently. Much depends upon the quality of the gas. It is not necessary to remove the bell when changing the water.

Opportunity should be taken to cleanse the tank, and by washing it out and by using a wire brush to remove traces of rust and corrosion.

The inside of a tank is usually painted with red-lead paint. It is usual to renew the paint once in five years; but, under adverse conditions, it may be necessary to renew it as often as once in two years.

After cleansing, the red-lead paint should be renewed where it has been rubbed off by friction, and the whole may be coated with Japan varnish.

The outside of the tank should be kept clean and the brasswork bright. The outside iron should be painted and varnished when necessary.

The bell should be drawn to its full height after using every night, and the scales wiped. The inside should be washed and the outside painted as often as may be necessary, the old paint being removed by means of caustic soda.

The lower part of the bell should be periodically painted inside to the extent of about 3 in. above the bottom rim, care being taken that the paint does not reach above the lowest graduation of the scale. If the bell be lifted clear of the water each week-end, or alternatively, sufficient water be removed so as to expose the bell to the air, this painting will rarely be required.

The inspector should note that it is dangerous to lift a bell to its full height and leave it, when gas is used, because evaporation of water might lead to the formation of an explosive mixture. The safe method is to fix an extra air-cock to holders and charge with air when the holder is not in use.

Every three months, all the pivots, bearings, antifriction rollers, slides, cocks, &c., should be cleaned, greased, or oiled, as may be necessary. The cords and chains should be carefully examined and cleaned.

The standard gas-meter should be kept clean with polish as necessary. After use, all water should be carefully drained from the meter and the meter capped.

The leakage meters and King's gauge, where used, should be emptied and washed every three months, and always kept clean and bright. The zero of the King's Gauge should be carefully adjusted weekly.

* The fees payable, as at present prescribed, were given last week, p. 774.

† The existing Order in Council with reference to this matter is dated Dec. 21, 1907.

GAS REGULATION ACT APPLICATIONS.

The following further notices appear in the "London Gazette" of applications by gas undertakings to the Board of Trade under section 1 of the Gas Regulation Act for Orders providing for—(*a*) The repeal of any enactments or other provisions requiring the undertakers to supply gas of any particular illuminating [or calorific] value, and the substitution therefor of power to charge for thermal units supplied in the form of gas; and (*b*) the modification of the statutory or other provisions affecting the charges which may be made by the undertakers by substituting for the maximum [or standard] price per 1000 c.ft. now authorized, with an addition to meet increases in the costs and charges of, and incidental to, the production and supply of gas by the undertakers since June 30, 1914, a maximum [or standard] price per therm (100,000 B.Th.U.).

Any local authority or person desiring to make representations with regard to the application may do so by letter addressed to the Assistant Secretary, "Power, Transport, and Economic Department," Board of Trade, Great George Street, S.W., and posted not later than the date specified in the notice.

Hampton Court Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 5½d. per therm.

Harpenden District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 9d. per 1000 c.ft.; and the price they ask the Board of Trade to substitute for this is 1s. 6d. per therm.

Lea Bridge District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price which they have asked the Board of Trade to substitute is 1s. 7d. per therm.

Portsea Island Gas Light Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are: Within the Island of Portsea 3s. 4d. per 1000 c.ft., and within the parishes of Portchester, Farlington, and Cosham, and also that part of the borough of Portsmouth known as Cosham Ward (till recently part of the parish of Cosham) 4s. 6d. per 1000 c.ft.; and the prices which they have asked the Board of Trade to substitute for these are: Within the Island of Portsea 16·4d. per therm, and within the parishes of Portchester, Farlington, and Cosham, and also that part of the borough of Portsmouth known as Cosham Ward 19·2d. per therm.

Richmond Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 3d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6 6d. per therm.

Swansea Gas Light Company.

The statutory maximum prices authorized in respect of the supply of gas by the undertakers are 3s. 6d. per 1000 c.ft. within the borough of Swansea and a distance of one mile of the boundary of the borough as existing in the year 1910; 3s. 10d. per 1000 c.ft. within a greater distance than one mile from the said boundary (except in the parish of Oystermouth); and 5s. per 1000 c.ft. within the parish of Oystermouth. The prices which they have asked the Board of Trade to substitute for these are 22·70d. per therm within the borough of Swansea, and a distance of one mile of the boundary of the borough as existing in the year 1910; 23·45d. per therm within a greater distance than one mile from the said boundary (except in the parish of Oystermouth); and 26·70d. per therm within the parish of Oystermouth.

SPECIAL ORDER UNDER SECTION 10.

Glastonbury Corporation.

The Corporation have applied for a Special Order to empower them to acquire certain lands for gas-works purposes.

COLONIAL GAS ASSOCIATION, LTD.

An Anxious Time Passed Through, But Business Prospects Good.

The Ordinary General Meeting of the Association was held last Thursday, at the Cannon Street Hotel, London, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) read the notice convening the meeting and the report of the Auditors; and the Directors' report and the statement of accounts were taken as read. The report mentioned the occurrence, during the year, of two strikes of gas-workers, and also strikes of seamen and marine engineers, all of which seriously impeded the operations of the Association. The two gas-workers' strikes affected the whole of the Melbourne area, in which are situated the principal works of the Association; and the object of the latter of these was no less than to enforce demands, including a large increase of wages, which were then under the consideration of the Court of Arbitration. Public opinion was greatly aroused by this arbitrary proceeding; and the gas companies were supported by numerous volunteers. After a struggle which lasted for nearly two months, the men gave way, and returned to work on practically the old terms. For this gratifying result, the Directors had recorded their acknowledgments to the Chairman of the Melbourne Board (Mr. P. C. Holmes Hunt), and his two colleagues; the Managers respectively of the Footscray and the Box Hill works (Messrs. Parsons and Tipper); and the various officials acting under their direction at works and offices. It was not to be expected that such circumstances should be unattended by loss of revenue and additional expenses. Nevertheless, the profit for the year amounted to £18,958, as compared with that for the previous year of £18,568. To this had to be added the balance brought from the previous year, making a total of £24,282, from which, after providing for debenture and other interest, also for renewals and depreciation, and deducting the dividend paid on the preference shares for the half-year ended Dec. 31 last, there remained an amount available for distribution of £17,089. The dividend on the preference shares for the half-year ended June 30 last was paid on Nov. 1; and, under normal conditions, the Directors would have been prepared to recommend payment forthwith of a cash dividend on the ordinary shares at the same rate as was paid last year—namely, 7 p.ct. (less tax). Unfortunately, however, the present financial position in Australia precluded the possibility of receiving remittances of any amount for some time to come; and therefore the Directors recommended that a dividend at the increased rate of 7½ p.ct. (less tax) for the year ended June 30, 1920, be paid by the allotment of 7 p.ct. preference shares. The amount to carry forward would be £6318.

The CHAIRMAN, in moving the adoption of the report and accounts, said he felt sure the shareholders, in common with the Directors, must be very much disappointed with what the Board had been obliged to recommend by the force of circumstances over which they had no control. It was needless to say what an anxious time the Directors here and in Australia had passed through since the meeting a year ago, when they had really started upon, as was then thought, more peaceful and prosperous times. They should be having more successful and steady work, and greater progress; but the circumstances mentioned in the report—the unrest in Australia, and demands for increased wages, &c., causing a strike lasting two months—had brought about results for the past year which had not come up to the standard hoped for twelve months ago. However, with all the drawbacks, it was very gratifying that the balance-sheet presented should be again a record, though only slightly more than the previous year, and not so much as was quite reasonably expected and anticipated. The shareholders would have noticed that the ordinary dividend was recommended to be increased from 7 to 7½ p.ct.; and he thought it might be satisfactory to them to know that their excellent Chairman of the Melbourne Board, Mr. P. C. Holmes Hunt, in his report, mentioned that 8 p.ct. had been earned, and could be paid. This being so, the Directors here considered they were justified in recommending the increased dividend. The current year's working, starting on July 1, with the further increased charges arising from cost of wages, coal, materials, &c., made one think things were not quite so bright as one could wish. Still, he thought it need not make them too pessimistic, as the demand for gas and residuals was increasing most favourably. He would like to mention that the September quarter returns had recently come to hand, and showed the very satisfactory increase of 19 p.ct. over the corresponding quarter of last year. This was, indeed, a very hopeful sign that the current year's working cannot help being satisfactory. Of course, their great drawback had been the shortness of capital. Every shareholder in gas companies knew the difficulty of getting capital, and what an anxious time all undertakings at home and abroad were experiencing through not having more support. If the Association could get the benefit of some £30,000 or £40,000, the money could be most profitably expended, giving even better returns than what was now recommended as a dividend, as extensions were needed at all their fifteen works, and the demands of consumers were more than could be coped with. The present balance-sheet, he was pleased to say, was again a record; and the Board less than two months ago were feeling pleased to think that at this meeting they would be able to recommend the increased dividend, and pay same in cash. But, alas, on the 9th of November the "unexpected happened," as they had a cable saying their bankers "agreed to the declaration of the 7½ p.ct. dividend on the ordinary shares, but they could not remit on account of the balance of trade exchange against them." This very upsetting cable caused the Directors to have a special Board meeting; and as there was no chance of obtaining the £7000 or £8000 required for the dividend, it was decided to recommend that the payment be made in preference shares. The Directors hoped, in the circumstances, this course would meet with the approval of the shareholders. It would be noticed that the balance-sheet was signed on Nov. 3, and that the cable to which he had just referred was received on the 9th. This was why the meeting was being held that day, instead of three or four weeks earlier. In the report, mention was made of the two months' strike at all the gas-works in the Melbourne area; and those affecting the Association were as serious as could be imagined. However, with the great assistance of ready helpers, the consequences to the consumers, though most unpleasantly inconvenient and serious, came to a satisfactory end; and he was sure the best thanks of the shareholders would be most heartily and cordially given to those assisting the efforts of the Melbourne management, and especially to Mr. Holmes Hunt, Mr. Figgis, and Mr. Weir, as well as the Managers, Mr. Parsons and Mr. Tipper. Before closing his remarks, he would like to call attention to the balance-sheet, and to point out that, in spite of the strikes, &c., that were in operation in June last, there were again record figures in the revenue account, which was most satisfactory. On the credit side, it would be noticed that the stock of coal was reduced; the great difficulty being in getting deliveries. The gas sent out had to be restricted considerably; and by adopting this course, the supply was not cut-off at any of the works. As already mentioned, the want of capital did not admit their carrying out any extensions, &c., that were not actually necessary. In view of the enormous increase in cost of wages, coal, and materials, the business had to be financed with the greatest care; and this really meant their having to pay the dividend recommended in preference shares, or passing it altogether. A year ago he spoke of the urgency of further capital; and it was even more necessary now than then. If it was not forthcoming, extensions could not be carried out, and it would not be possible to take-on more consumers, of which there were a great number anxiously waiting to be supplied with gas. It was most satisfactory to be able to state that the strike expenditure had been dealt with, and that they were not carrying forward any debit in this respect. The shareholders would also be pleased to know that the unaccounted-for gas had been reduced; that the sale of gas per ton of coal used at Footscray (the Association's largest works) was 13,300 c.ft. per ton; and that the capital stood at the very low amount of £946 per million c.ft. of gas. He would like to point out that the debenture and preference dividends were paid on the due dates; and the carry forward was £6318, as against £5324 a year ago. The 7½ p.ct. now proposed, with 4s. tax deduction, gave a net income of 6 p.ct. as dividend, which amount was a most excellent one from a gas company.

Mr. CHARLES HUNT seconded the motion; remarking that the lucid speech of the Chairman had really left him nothing to say, except it might be to emphasize the fact that the accounts showed that the working results were the best which the Association had ever had, notwithstanding the disadvantages of strikes and other like matters. This fact was full of promise for the future of the undertaking.

Mr. A. A. SAWARD said he understood that the receipts had increased, and that during the year they had made a good profit, but that it had been impossible to remit this profit to London. The money was, however, in Australia, and was being used for the purposes of the Association, so that they would really be getting the benefit of it as capital. These preference shares would, of course, mean more interest to be paid in the future.

The CHAIRMAN said the 19 p.ct. increase for the quarter ended September gave good promise of greater sums being available for dividend. What the Board proposed to do was the best thing in the circumstances—he was quite sure that it was better than passing the dividend altogether. But he had every sympathy with those shareholders who were wanting their dividends now in money, and were getting paper.

The resolution was then carried unanimously.

Mr. HUNT next moved: "That a dividend of 7½ p.ct., less income-tax at 4s. in the pound, be and is hereby declared upon the ordinary shares of the Company for the year ended June 30, 1920, and that such dividend be paid by the issue of 7 p.ct. preference shares of the Company, credited as fully paid up, and bearing dividend from Jan. 1, 1921; and that fractions of such shares be paid in cash."

The Hon. Sir JOHN W. TAVERNER, K.C.M.G., who seconded, said he thought it was not necessary for him to tell the shareholders how sorry the Board were to be in the position, through no fault of their own, of not being able to pay a cash dividend on the ordinary shares. Those of them who studied the newspapers would have noticed that great interest was being taken in endeavours to bring about the establishment of greater facilities for doing trade with foreign countries; and he, as an Australian, often felt surprised that the Dominions did not get a little more consideration from the Mother Country, in the way of help in financial matters. As had been remarked, a pleasant feature to be set against not receiving a cash dividend was the fact that over £10,000 of revenue had been spent on capital account; and this was all going to build-up a sound position for the future. He ventured to say there was to-day no company in a sounder position than their own. When they considered the times that were being passed through, and the terrible disadvantages and handicaps in Australia against which they had to contend, he thought the Melbourne Board and the management out there were entitled to every credit. He hoped that next year might bring about an improvement in the condition of things. It was gratifying to know that the wool crop and the wheat crop were large, and general production was going ahead very fast. Everything, therefore, so far as Australia was concerned, seemed to him to point to matters, in the course of another year, getting back to something like old times.

The proposition was agreed to unanimously.

The CHAIRMAN, proposing the re-election as Directors of Mr. John S. Weir and Mr. H. King Hiller, said Mr. Weir was born in Australia, and had had an excellent training in gas matters. A better man they could not possibly have to look after their interests on that side. As to Mr. King Hiller, he had been a most active and painstaking Director; and the Board had been very pleased to welcome him as a colleague on his retirement from his successful career as Gas Engineer at Shanghai.

Mr. F. R. SMITH seconded the re-election, which was agreed to, and acknowledged by Mr. KING HILLER.

On the proposition of Mr. W. CHAFFER, seconded by Mr. SAWARD, the Auditors (Messrs. Wood, Drew, & Co.) were also reappointed.

The CHAIRMAN, replying to a vote of thanks to himself and his colleagues, referred in cordial terms to the work of the Directors, managers, and staff on the other side, to whom, he said, their most earnest thanks were due.

The vote of thanks suggested by the Chairman was cordially passed on the proposition of Mr. SAWARD, seconded by Mr. CHAFFER.

CEARÁ GAS COMPANY.

The Difficulty in Obtaining Coal.

The Annual General Meeting of the Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. F. W. BROTHERS (the Chairman) presiding.

The SECRETARY (Mr. E. Pratt) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN, on rising, expressed the great regret felt by the Board at the death last February of Mr. F. A. Wallroth, who had served the Company as a Director for something like forty years. He always did the very best he could; and his colleagues had found his opinions and advice of the greatest help to them. Proceeding to move the adoption of the report and accounts, the Chairman said the working conditions during the past year had been no less trying than those the previous year. Soon after the meeting in October, 1919, the miners of bituminous coal in the United States handed in notices to cease work, which suspension lasted for some months. When a resumption took place, "home" deliveries had to take the precedence of those for export; the result being that up to the present time no "high-grade" gas coal had been obtainable for cargo liners at New York harbour. The "after-war" conditions in the United States appeared, therefore, similar to those obtaining here—*i.e.*, a great demand for bituminous coal for various purposes, shortage of trucks, chaos on railways, and labour troubles from time to time. The effect of all this had been most unfortunate for the Company; for the cost of producing gas had been increased, while the quantity of residuals for sale had been much less. The principal items of expenditure under post-war conditions had been similar to those of last year. The period of abnormal prices appeared, however, to be on the wane, a fall in the price of certain metals—excepting iron—giving indication that purchases in the future might be on a lower level. After a period of great anxiety, quite beyond anything experienced since 1914, he was pleased to say that an opportunity had at length arrived to obtain a small quantity of coal both from here and from the United States, at prices much less than those ruling a few months ago. This should help the manager out of a difficulty greater than any experienced hitherto. Regarding the financial condition of the State of Ceará, he was sorry to say that, following two years of drought, the situation had for some time past given cause for anxiety. The amount owing for street lighting was about £4700 more than at June 30, 1919—representing some six months' arrears extra. Remittances, in consequence, had been less. Increased expenses in the meantime, and coal and freight coming all together, reduced the cash in hand to a minimum for the time being. This meeting had been postponed as long as was possible, so as to get the latest news from Ceará. As forecasted in the report, the debenture holders might be called upon to exercise a little patience in the matter of the payment of the interest due for the past six months. After a period of exceptional prosperity, during which exports from Brazil were much in excess of the imports, causing the rate of exchange to soar to well over 18d. per milreis, the tide turned in the early months of the year. About mid-April the rate declined to below 16d., and since has got down to between 9d. and 10d. The future it was difficult to forecast. There were signs that a season of normal rainfall might occur throughout the State; but the benefit from that could not be felt until May or June next. In the meantime, the situation might continue critical.

The motion was seconded by Mr. THOMAS M'MAKING, and duly carried.

Proposed by the CHAIRMAN, and seconded by Mr. M'MAKING, the retiring Directors (Mr. F. E. Linging and Mr. Charles Webb) were re-elected; and the Auditor (Mr. W. J. Wright) was also re-appointed, on the motion of Mr. R. M. LONG, seconded by Mr. A. H. BRANDT.

The CHAIRMAN proposed a vote of thanks to the Engineer and Manager and the staff in Ceará, and the Secretary in London. He remarked that he could not say too much in praise of Mr. W. A. V. Watson (the Engineer), who had been confronted with a most difficult position in regard to fuel and other matters, and had shown himself to be both an admirable engineer and a man of great resource.

Mr. WEBB cordially seconded the vote, which was passed.

The Chairman and Directors were also thanked for their services.

Increase in Price at Newcastle.—The Directors of the Newcastle and Gateshead Gas Company regret that, owing to the great fall in the value of residuals, particularly of coke shipped abroad, it is necessary to revert to the price charged for gas in June last—viz., 3s. 4d. per 1000 c.ft. (less discounts) in respect of all gas consumed after the December readings of the meters. The new price will represent an advance of only 60 p.ct. above the pre-war price. In June last a reduction was made of 10d. per 1000 c.ft. Mr. T. P. Ridley (the Secretary and Commercial Manager of the Gas Company), in answer to inquiries, explained that the price of coke for export had lately fallen by from £8 to £9 per ton. Not only had coke dropped in value, but also other residuals—such as sulphate of ammonia and pitch. Nearly all the pitch went abroad, as did large quantities of sulphate of ammonia. In one foreign market, sulphate had fallen from £45 to £30 a ton.

Wolstanton Gas Conditions.—An improvement in the supply of gas was foreshadowed at a meeting of the Wolstanton Urban District Council last week, when Mr. W. J. Hassam (the Chairman of the Gas Committee) made special reference to the question. He said there had been a great strain on the supply of gas from the Chesterton works; and it had been decided to ask Newcastle to help them out of their difficulty. They came to an arrangement whereby Newcastle agreed to supply the Basford area at a price which was very satisfactory. Further negotiations for a supply of coke-oven gas had been proceeding with a company in the district. Over a year ago he discussed this matter with the company referred to; and later on Newcastle came along, and the two authorities negotiated jointly with the company for a supply of coke-oven gas for the two areas. He hoped that at the next meeting of the Council the Committee would be able to put forward a concrete proposal.

POOR COAL AND INADEQUATE SUPPLIES AT SOUTHPORT.

At a Meeting of the Southport Town Council this week, the Gas Committee reported that on Dec. 14 they instructed the Gas Engineer (Mr. John Bond) "to prepare a full report on the causes for the poor quality of gas as at present being supplied." Mr. Bond, in the course of his report, says:

I have no doubt that the majority of the Committee will remember that, through the order of a Government Department, the coal supplies to the Southport gas undertaking were diverted into other channels, which caused the Gas Department to lift the whole of their coal from stock, with the exception of two days' requirements. They will also remember that I strongly objected to this action, and pressed the Government Department as far as it was possible to pay the expense the Gas Department were put-to in lifting the stock, as I did not consider it just to the ratepayers of Southport that they should be called upon to pay the expenses, which, in my opinion, should have been borne by the town to which the coal referred to was sent. Since that time the department have not been able to secure sufficient coal for stocking purposes to keep the undertaking working for one month. The gas undertaking should not have a less stock than would last one month, especially during so many disturbances which have from time to time taken place—such as the railway, moulders', and miners' strikes. At the beginning of the miners' strike, the Gas Department had approximately 3000 tons of coal in stock, which would have enabled the Department to give an adequate supply of gas, in accordance with the statutory requirements, for twenty days. You will therefore appreciate that it was necessary for me to make preparations for the manufacture of gas from coke, as I assumed that supplies of coal would be curtailed for a period of 42 days; and it was necessary to allow a margin of safety to maintain the heating of the settings, should the strike last longer than was anticipated. I assumed that the strike would last one month; and through the congestion of wagons, a large number of which occupied the gas-works' sidings, it was quite obvious that delays would take place between the collieries and the gas undertaking after the miners had returned to work.

Immediately before the coal strike, the major portion of the coal delivered to gas-works contained a great amount of shale and pyrites; and it was difficult for the department to maintain the required volume and quality of gas. I am of the opinion the Board of Trade realized that this would be the case, as they gave the gas undertaking instructions to reduce the quality. As soon as the coal strike commenced, coal supplies were suspended, and there was a greater demand for gas by the public; and it became necessary to reduce the pressure of gas to curtail the output—otherwise the department would have been in a serious position. A small quantity of coal was delivered as soon as the empty wagons could be removed by the Railway Company. It was approximately one week before the department received supplies sufficient to maintain a medium gas output, and the quality of the coal was poor, owing no doubt to the falls in the roofs which had taken place in the various works of the mines. The department also suffered through the congestion of the traffic on the sidings. The position might have been worse had the department taken the recommendations of the Supplies Committee and received coal from the Durham and Northumberland district, as experience had shown that a large quantity of this coal is not a good gas-making coal. The Coal and Coke Supplies Committee did obtain for the Gas Department 150 tons of Lancashire coal; but this, unfortunately, had to be stopped on account of the poor quality of the material. The Coal Supplies Committee have written me stating that by my not taking the Durham and Northumberland coal, and rejecting the material they were sending, I have to shoulder the responsibility with regard to supplies. The Gas Committee already know that the Gas Department was unable to get material for the necessary repairs and renewals for the gas undertaking during the period of the war, which was followed by the moulders' strike, and prevented the department from getting the machinery brought to a thorough state of efficiency. During the coal strike, and since, machinery breakdowns have been frequent, and have interfered in some measure with the manufacture of gas. The position has now improved, and every step is being taken to see that the coal received from the collieries is of a quality suitable for gas-making purposes. Unfortunately, the Gas Committee are at the present moment unable to enter into contracts for the supplies of coal; and during the long period under which coal has been under control, neither the Gas Committee nor the officials have the power to reject coal allocated to the undertaking without the risk of going short.

I am of opinion that, so long as control exists, and there is no competition in the sale of coal, the present state of affairs will not materially improve. I was advised that I could obtain supplies from the Yorkshire area; but, after testing a number of samples, I have not yet been able to find a coal which I could recommend the Gas Committee to purchase. Your Chairman paid a visit to London and attended the meetings of the Federation of Gas Employers and the National Gas Council. He placed the position before this influential body with the object of having the matter placed before those responsible for this deplorable state of affairs. The Chairman gathered that complaints of poor quality of coal are general. I maintain that the gas industry generally is not in any way receiving the treatment it deserves after the help that was willingly given to the nation during the period of the war, at a great cost and inconvenience to all concerned. The public generally has been most patient with regard to the inefficient gas supplies; and I am not surprised to know that some members have cause to complain. Everything possible is being done to neutralize the effect of the many disturbances which have taken place during the past six years.

Mishap to the Barnsley Gas Supply.—Consequent upon a mishap to some of the machinery, the gas supply at Barnsley failed on Tuesday night of last week. Prompt measures were taken to remedy the trouble; but naturally much inconvenience was felt. Some licensed houses closed-down altogether.

INCREASED OUTPUT AT BELFAST.

In a review of the working of the Belfast gas undertaking during the past year, it is declared still to merit the title of the "milch cow of the Corporation" as regards profits, "although its reputation for cheap and good gas is now a matter of history." Gas at present costs 3s. 8d. per 1000 c.ft. net, as against 1s. 8d. in 1915; and while there was a temporary abatement during a short period of the current year, owing to reduction in coal prices, the return of the latter to former figures caused a corresponding return in gas prices. Notwithstanding the vastly increased use of electricity, both for lighting and power, the output of gas continues to increase. On the last annual return there was an increase of 389 million cubic feet, or 14·6 p.ct. over the previous year. The proportion of water gas (813 million cubic feet) was the lowest for many years. The gross profit was stated at £75,650. After providing for interest, &c., the net profit was £26,404, to which was added £11,478, the balance brought forward from the previous year. Out of the total, £11,416 was allocated to interest and sinking fund on the cost of the City Hall, leaving £26,466 to be carried forward. A further capital expenditure in connection with gas-works extension is imminent, among the additions contemplated being a large gasholder.

The salvage in coal-gas residuals last year was about 52 p.ct. of the price of coal. Up to 12 or 15 years ago they realized from 86 to 94 p.ct. of the cost of coal carbonized. Thus, although £174,000 last year appears to be a huge sum, the percentage of coal carbonized which it represents is the lowest proportional return for residuals in the whole history of the gas-works. In the previous year the proportion amounted to 61·2 p.ct. The differentiation in recent years may, it is pointed out, be unavoidable; but it has a useful result on the net cost of gas production. There has been a steady increase in the demand for gas—more than 10 p.ct.

RATING OF GAS UNDERTAKINGS.

Effect of Recent Legislation.

At a Meeting of the Surveyors' Institution, Westminster—Mr. W. P. Ryan, a member of the Council, presiding—Mr. H. STEWART LOGSDON discussed the subject of "Rating, as Affected by Recent Legislation," and referred to the Gas Regulation Act, 1920.

He remarked that the main provisions of the Act gave power to gas companies to charge for gas supplied according to thermal units, and to modify the statutory or other provisions affecting such charges. It was the latter of these two provisions with which rating surveyors were concerned, as directly affecting the rateable value. The standard or maximum price per therm should be such as appeared to the Board of Trade, upon application, necessary to meet the increase (if any) in the cost or charges of, and incidental to, the production and supply of gas since June 30, 1914, due to circumstances beyond the control of, or which could not have been reasonably avoided by, the undertakers. The effect of the Act should be to increase and maintain the financial status of gas companies, and consequently to reflect upon their rateable values. He ventured to suggest, however, that any increases allowed in the price of gas under the Act would not be sufficient to reinstate gas undertakings in their pre-war flourishing financial condition or maintain pre-war assessments. Regarding post-war rating, as it was now possible to invest money at 6 p.ct. with the security of the British Government, it was but reasonable to assume that any lesser security should carry a higher rate of interest. This would have the effect of increasing any rental arrived at on what was commonly known as the "contractor's principle"—namely, a percentage upon the cost or present value of the buildings to be rented. If this was conceded, it followed that the rateable value should also increase.

The increase in the cost of repairs and renewals had a direct effect upon the rateable value of all property, as the average annual cost of these might be deducted from the gross estimated rental to arrive at rateable value. Outside London there was no limit to the amount of this deduction; while in London there was a maximum rate of deduction fixed by Statute for all except "special properties." Outside London, if the deduction made properly took into account the increased cost, there would be no injustice in the resultant rateable value. This was not the case in London, however, where, speaking generally, any increase in the gross value, which determined the amount of the deduction, was not sufficient to bring the deduction up to the actual average cost of repairs, &c. The maximum deductton was now only sufficient where the site value formed a large proportion of the gross value.

It was interesting to note that the Government, by the Finance Act, 1919, had recognized the fact that the statutory deduction for repairs for income-tax purposes was, in many cases, not sufficient; but they had not amended the statutory limits of deductions for rating purposes in London. In valuing "special properties," a larger sum than hitherto must be set aside as a renewal fund, to re-instate the hereditament at the end of its life. He thought it was safe to say that, no matter when the time arrived, the re-instatement would not be done at pre-war cost. The estimated increase of this cost would depend to a large extent upon the likely date of re-instatement. Probably the crest of high prices had now been reached; and the cost of re-instatement would therefore be less the further off the date of renewal.

One of the most serious factors affecting the rateable value of property was the increase in local rates. A rise in the rates was in itself sufficient to decrease the rateable value—a fact which was often overlooked. For instance, if the rateable value, *plus* rates, of an undertaking was £2500, and the rates, at 10s. in the pound, equalled £833, the rateable value would be £1667. If, in the same case, the rates increased to 16s. in the pound—namely, £1111—the rateable value would be £1389. The post-war conditions had produced many anomalies in our existing rating system; and the time had arrived when the whole subject should be taken under review, and the law and practice amended to meet the requirements of present-day and prospective conditions. The method of valuing for rating purposes public undertakings which were not in existence at the time of the passing of the Acts that governed present-day practice, led to many difficulties and unsatisfactory results.

The present system of leaving the assessments in the hands of the overseers, who were not compelled to make a regular and periodic revaluation (except in the Metropolis), was very unsatisfactory. In many instances he knew of assessments in force to-day which were made very many years ago, when circumstances and values were entirely different. It would, in his view, appear to be of general advantage, and lead to equity of assessment, if it were compulsory for the authorities outside London to make a complete and periodic revaluation, similar to the quinquennial valuation in London. Indeed, there did not seem to be any valid reason why the two parts of the country should be differently treated. Any revision of the rating system would be incomplete which did not provide for a uniform method of dealing with machinery in valuing rateable hereditaments, which in some parts of England was taken into account in estimating rateable value and in others absolutely ignored.

FATAL GAS LEAKAGE AT NEATH.

Explanation at the Inquest.

On Christmas night, at Neath, George Jones (a platelayer), his wife, and her mother, were all asphyxiated in their beds, through a leakage of gas in circumstances explained at the subsequent inquest.

A visitor at the house left them at 10.30 that night, after having drawn attention to a smell of gas, in reply to which Jones said: "I tried to put a penny in the meter; and it would not go in." A neighbour declared that he saw the people alive at 1 o'clock on Christmas night; and there was no smell of gas there then. The deceased were slightly under the influence of drink. Another man who was also in the house that night drew Mrs. Jones's attention to the smell of gas. The constable, who found the bodies, said there was a leak in the pipe close to the gas meter.

Mr. W. Clark Jackson (Gas Manager) stated that he found, upon inspection, that the inlet-pipe to the meter had been broken, and that a considerable escape of gas was issuing from the break. From the size of the opening caused by the break, he estimated that the gas had been leaking to the extent of approximately 40 to 60 c.ft. per hour. After turning the gas-cock off, he examined the meter, to see if he could find out the reason for the break having occurred in the pipe. As he had come to the conclusion that this must have been done by force being used on the meter—probably in connection with the inserting of a penny—he tried himself to place a penny in the slot; but this he found to be impossible. He therefore asked his foreman, who had by this time arrived at the house, to disconnect the meter. Upon further examination, Mr. Jackson found that the meter-index, which records the amount of gas paid for and not consumed, was registering to the extent of practically 350 c.ft. At this position an automatic stop comes into operation on this particular type of meter, which prevents any further coins being inserted until a pennyworth of gas has been consumed. He therefore came to the conclusion that some person on the previous night had inserted several pennies into the meter, and not noticing that the automatic stop had come into operation, the person concerned had tried to insert still another penny, and, finding that there was difficulty in doing so, must have used some force on the meter itself to try and get the penny to drop in, thereby twisting and breaking the inlet connection-pipe. This opinion was confirmed upon later reflection and consideration, as the meter had been tested by his meter inspector, who reported that the meter was in working order, including the automatic arrangement, and also that signs on the side of the meter pointed to some appliance such as a pair of grips or pliers having been used to force back the handle. These pliers or grips must have slipped, and skinned the side of the meter. He added that he very sincerely regretted this most unfortunate accident, and extended his sympathy, and the sympathy of the Gas Committee, to the relatives of the deceased. But he would emphasize the necessity for care being taken by consumers when inserting pennies into the slot-meters, as they had had a considerable number of cases where prepayment meter consumers had twisted and damaged the pipe, using force in trying to insert bent pennies.

The Coroner remarked that the case should serve as a warning to people to examine their gas meters and pipes carefully, and if they found any leakage to have it remedied. It was also important they should keep their windows open. If these people had left their windows open, their lives might have been saved. One witness had said that deceased were under the influence of drink; but the others had not confirmed this, and none of them had seen any signs of drink in the house.

The jury returned a verdict in accordance with the medical evidence, and said they were of opinion that the deceased were not under the influence of drink.

Alderman Hopkin Morgan, on behalf of the Gas Committee, said he wished to express the regret of the Committee at the unfortunate occurrence.

Trouble from Poor Gas-Fittings and Burners.—In reply to complaints sent recently by the Bentley District Council to the Doncaster Corporation as to alleged poor gas supply, a letter was read at a Bentley Council meeting last week from the Doncaster Gas Engineer (Mr. Robert Watson), stating that for a few days recently the pressure had to be reduced owing to coal trouble; but otherwise the charts at Bentley showed that the pressure was greater than that of last winter. It was proposed to lay further mains in the new year to give additional pressure. Mr. Watson stated also that, on one of the evenings of which complaint had been made, he had seen, at Bentley, good lights side by side with poor ones, indicating that the chief trouble was very local—due to poor fittings or burners requiring cleaning. The Gas Department were willing to help or advise consumers.

"NATIONAL" BENZOLE REDUCED FROM JAN. 1.

Motorists generally throughout the country are aware that the Customs Duty on imported motor spirit is being abolished under the new Government legislation, and that a corresponding reduction in price has been made on petrol as from the 1st inst. In this connection the following explanation of the facts has been issued by the National Benzole Company, Ltd., and which is important in view of the attitude the Government adopt towards British industry during such a critical trading period as at present exists.

It is perhaps not generally known that "National" benzole, which is a home-produced motor spirit, has been exempted from taxation in order to encourage its production, and to allow distribution arrangements to be made, and also to allow it to be sold competitively with imported motor spirits.

Since the formation of the National Benzole Company, "National" benzole has been produced by its members (who represent approximately 80 p.ct. of the producers in the country) to a standard specification, which was agreed upon after consultation with the leading motoring experts, and the scientists throughout the country; the result being that the home-produced spirit has been tested by various motoring organizations and proved to be at least 20 p.ct. better than any imported motor spirit. This result is confirmed by actual users under commercial conditions. Large installations have also been erected throughout the country, involving the expenditure of a great amount of capital.

By the action of the Government, the advantages which have been given to the producers of motor spirit in this country have been taken away, without warning or consultation with the pioneers of the industry, who have done so much for the benefit of the motorists. One could forgive the Government for their policy if the country was in such a position that taxation was not necessary in the future; but the removal of the tax on imported spirit is replaced by a tax on the vehicle or car instead of the spirit.

It will be seen, therefore, that it is possible to reduce the price of imported spirit without any loss to the petrol distributing companies; whereas any reduction from the price of "National" benzole is an actual loss to the producer. In addition to this loss, the benzole producer is liable to the vehicle tax, which is a considerable additional burden to his cost of distribution. It is therefore surprising that a Government elected to study the welfare of the nation should handicap British industry in this manner—especially in view of the critical position which envelops the country at the present time, and the urgent necessity of assisting the employment of British labour.

In spite, however, of the disadvantage of the new legislation to British industry, the producers are prepared to make a sacrifice in order to maintain their trade, which they consider is of vital importance to the country, and of considerable assistance to the motoring industry. The prevailing high costs of production do not permit of a reduction in price equal to the tax which is being withdrawn from petrol, if the excellent quality and high standard of efficiency is to be maintained, which the National Benzole Company consider is of the utmost importance; and under no consideration whatever will the quality or efficiency be reduced in any small degree.

It is, however, the desire of the producers to always offer the public a decided advantage on an efficiency basis over any other motor spirit, and the price therefore is being reduced by 3d. per gallon as from Jan. 1. It is hoped that a return to normal working conditions will come about speedily, in order that the industry may further develop its activities and place the producers in a position to increase the supply of the motor spirit to the general benefit of the community.

GAS FOR HOUSING ESTATES.

The Question of Guaranteeing the Cost.

The Town Clerk reported, at a meeting of the South Shields Corporation Housing Committee, correspondence which he had had with the Ministry of Health in regard to the supply of gas and electricity, and that he had inquired whether any allowance would be made to the Council in respect of the capital cost of these services. In reply, the Ministry stated they had forwarded the application to the Housing Commissioner for attention. He read a letter from the Housing Commissioner saying that, unless there are very special circumstances, it would be undesirable, on account of the additional cost incurred thereby, to provide both a gas and electricity service to the houses. It would assist him in the consideration of the case if the exact cost of installing the gas could be ascertained, and what guarantees for this purpose would be necessary. In the meantime, he assumed that no arrangement was being made to wire the houses for electric light.

The Borough Engineer reported that he had asked the South Shields Gas Company for the terms on which they would supply gas; and he submitted a letter in reply stating that the cost of providing trunk mains, distributing mains, and service-pipes from the mains to the inlet of the meter would be £40 11s. 6d. per house, provided that 1000 houses were supplied with gas not later than Dec. 31, 1922. In the event of 1360 houses being erected and supplied with gas not later than Dec. 31, 1923, the estimated cost would be reduced to £36 12s. 10d. per house. The prices quoted do not include the supply and leading of internal house-piping other than the provision of the service-pipe up to the inlet of each meter; and they are based upon present prices for material and labour.

In regard to the terms of payment, the Corporation would be required to pay to the Gas Company each month, during the progress of the work, 80 p.ct. of the cost of work executed during the previous month; a further 10 p.ct. three months from the first payment; and the remaining 10 p.ct. within one month of the completion of the trunk mains, and also of the distributing mains and service-pipes in each street or road.

The Borough Engineer also reported that he had interviewed the Housing Commissioner in reference to this matter, and submitted a letter from the Acting Housing Commissioner enclosing a note in regard to guaranteeing gas companies for the supply of gas, and pointing out that the Engineer should make the best bargain he can with the Gas Company, and submit the matter to the Housing Commissioner or the Ministry of Health. The note referred to states that the owner or occupier is by the section required to pay for so much of any pipe as may be laid upon the property of such owner, or in the possession of such occupier, or at a greater distance than 30 ft. from any pipe of the undertakers (though not on such property). The owner or occupier may also be required to enter into a written contract to continue to receive and pay for a supply of gas for a period of at least two years, at a rent equivalent at least to not less than 20 p.ct. per annum on the outlay of the undertakers in providing pipes for such supply. Security to cover the cost of the pipes and of the gas must be given if required by the undertakers.

The matter was left in the hands of the Borough Engineer to interview the Housing Commissioner.

MINISTER OF HEALTH AND GAS FUEL.

A memorandum has been issued by the Minister of Health to the local authorities engaged in housing, with reference to the interim report of the Departmental Committee on Smoke and Noxious Vapours Abatement. The Committee insisted that much injury to health and damage to vegetation and buildings are caused by the smoke-laden atmosphere which results from the imperfect combustion of coal in domestic and other fires. Dr. Addison recognizes that the circumstances in different districts vary greatly—especially as between rural and urban areas. He hopes, however, that, so far as local conditions permit, effect will be given to the Committee's recommendations in the carrying-out of housing programmes. Even where schemes have been commenced, the Minister trusts that local authorities will, if possible, modify the heating and cooking arrangements of the dwellings, provided this can be accomplished without any material increase of cost. The Housing Commissioners have had their attention called to the matter, with the view of rendering assistance to the local authorities; and the Commissioners believe that the best results will be obtainable by the following means:

1.—The provision of gas for cooking purposes, instead of the ordinary coal-burning cooking range. Where gas is not available, the alternative should be considered of electric cooking (where the supply of current can be procured at a low rate), or ranges designed to burn coke or anthracite coal. Ranges of the latter type are on the market.

2.—The provision of means other than the boiler at the back of an open coal-fire for hot-water supply. The installation of a small coke-fired boiler in the scullery is found to give satisfactory results.

3.—The provision of coke-burning grates, gas-fires, or auxiliary heating by hot-water radiators in the living-rooms, parlours, and bedrooms. The burning of coal in open grates can, by this means, be dispensed with. The omission of brick fireplaces and flues, rendered possible by the use of gas-fires, will materially reduce the cost of the house and increase the area of the rooms.

4.—The adoption of a central installation for the hot-water supply and heating of a number of houses. In certain cases this may be found practicable, especially where waste heat is available Any extra cost is set off by resulting economies in construction.

TRADE NOTES.

[For "Journal" Advertisers.]

A "Glasmi" Prize.

The "Hardwareman," in their Advertising Exhibition Number offered £30 in prizes for what their readers considered the best advertisement in that issue. The offer resulted in the majority of votes being for the advertisement of Messrs. J. & W. B. Smith's "Glasmi" gas-mantles. A reproduction of the winning advertisement—the "Glasmi" Laughing Cat—printed on show cards, transparencies, postage stamps, or posters, will be sent post paid by the firm on receipt of request.

Messrs. James Milne and Son, Ltd

The twenty-second annual general meeting of this Company was held in Edinburgh on the 29th ult., when the Directors' report and the accounts for the year ended Sept. 30 were presented. Sir John Cowan, the Chairman of the Company, presided; and, in moving the adoption of the Directors' report, he made reference to the proposal to increase the capital, in order to meet the necessary extensions of the business. The report was unanimously adopted, as also the recommendation to pay a dividend of 10 p.ct., free of income tax, and to carry £5000 to the reserve fund, leaving a balance of £3504 to be carried forward.

A Great Graphite Concern and its Founder.

The name of Joseph Dixon frequently figures in our advertising pages in connection with the Joseph Dixon Crucible Company; but probably very few of our readers know what a remarkable man he was. Fewer still would believe that his name figured in one of the lists published when Andrew Carnegie started a discussion in the American press as to who were the twenty men who have practically made the civilized world what it is to-day. Joseph Dixon's name was included by one writer, whose selection was widely acknowledged at the time. It is to-day impossible to go into any city in the civilized world without seeing things bearing the mark of Thomas Edison; and this is almost equally true of the work of Joseph Dixon, though his work was less spectacular than that of Edison. Joseph Dixon was a man with a restless mechanical brain. Nothing was ever good enough. It must

be made better. At the age of 21, he was regarded in New England as an expert chemist. He studied medicine with intent to become a practising physician. But, seemingly, he lost faith in drugs, took up the business of an optician, and made lenses, grinding them with the aid of graphite—a plan that is still continued. He started business in Salem (Mass.) in 1827, manufacturing stove polish and crucibles; and later on he used graphite in the manufacture of lead pencils. In 1847 Dixon moved to Jersey City; and at that time his principal business was supplying crucibles for melting metals. Then, in 1887, as the demand for graphite products increased, and realizing that his own strength was failing, Dixon formed a corporation known as the Joseph Dixon Crucible Company. Two years later (in 1889) Dixon died; but the Corporation which he founded continues, constantly growing, constantly enlarging with the spirit of the times. To-day it is the largest of its kind in the world. Though the manufacture of crucibles and graphite pencils continues to be the biggest side of their business, the Dixon Company have of late years spent considerable money and time experimenting in the manufacture of graphite lubricants. In this, they have been extremely successful; and this success is largely due to the very wonderful lubricating qualities possessed by their Ticonderoga Flake Graphite. This graphite is mined solely by them in their own mines in Ticonderoga (New York State), no other graphite having flakes so microscopically thin, so free from abrasive impurities or able to cover so much surface per pound. This graphite is used in all their products manufactured for lubricating purposes. The Ticonderoga graphite is also used in the manufacture of Dixon's silica graphite paint, which has earned such a wide reputation as a long-service protective paint for all metal surfaces.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 3.

As is usual at this season of the year, very little business in tar products is being arranged. The pitch price for export remains nominally at not below 225s. per ton; but no sales are reported. Creosote is perhaps slightly easier at 1s. 3½d. in bulk; otherwise there is no change to record.

In sulphate of ammonia, the reduced prices recently arranged for the home farmers, &c., have come into operation with the New Year.

Tar Products in the Provinces.

Jan. 3.

The average values for gas-works' products during the week were: Gas-works coal tar, 120s. to 125s. Pitch (all pitch prices are purely nominal) East Coast, 175s. to 180s. per ton f.a.s.; West Coast—Manchester, 175s. to 180s.; Liverpool, 175s. to 180s.; Clyde, 180s. to 185s. Benzole 90 p.ct. North, 3s. 1d. to 3s. 2d.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 3s. 2d. to 3s. 3d. Toluol, naked, North, 3s. 1½d. to 3s. 2½d. nominal. Coal tar crude naphtha in bulk, North, 1s. 2d. to 1s. 3d. Solvent naphtha, naked, North, 3s. to 3s. 2d. Heavy naphtha, North, 3s. 1d. to 3s. 3d. Creosote, in bulk, North, liquid, 1s. 0⅝d. to 1s. 1⅝d.; salty, 1s. to 1s. 1d. Heavy oils, in bulk, North, 1s. 1d. to 1s. 2d. Carbolic acid, 60 p.ct., 2s. 7½d. to 2s. 9d. Naphthalene, £37 10s. to £40; salts, £10 to £10 10s., bags included. Anthracene, "A" quality, 1s. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

Owing to the holidays, many works have been closed, and business in coal-tar products has consequently assumed more or less of a nominal aspect. There is no change in the position of pitch or benzole. There is, however, distinct weakness in cresylic acid and carbolic acid. Creosote oil, however, remains fairly steady, as also does solvent naphtha, although there seems to be no recovery taking place yet in the rubber manufacturing industries, which are among the largest purchasers of solvent naphtha. Further weakness has developed in naphthalenes, refined qualities being particularly affected. There is practically nothing fresh to report in connection with intermediate products. Salicylic acid is in moderate demand; and makers of aniline oil and salt have fixed their prices for the home trade at 1s. 6½d. for oil and 1s. 7½d. for salts per lb.

The range of quotations is as follows:

Benzole: 90% London 4s. 1d., North 3s. 10d. to 3s. 11d.; 50-90% 3s. 6d. London, 3s. 3d. to 3s. 4d. North; crude 60-65%, 2s. 5d. to 2s. 7d.; pure, 4s. 3d. per gallon naked.

Crude Tar: London, 105s. to 115s.; Midlands, 107s. 6d. to 117s. 6d.; North, 105s. to 115s. per ton *ex* works. Refined tar, 95s. per barrel (free) on rail.

Pitch: London, 200s. to 205s. per ton f.o.b.; East Coast, 195s. to 200s. per ton f.o.b.; West Coast, 195s. to 200s. f.a.s., with Manchester 200s. per ton and Glasgow 195s. per ton; South Wales, 210s. per ton.

Solvent Naphtha: London, 3s. 1d.; Provinces average 2s. 11d. per gallon.

Crude Naphtha: Naked, 1s. to 1s. 2d.; North, 1s. per gallon.

Heavy Naphtha: 3s. 2d. per gallon.

Naphthalene: Refined flake, £35 per ton nominal; inferior, £25; crude, £14 to £18 per ton, according to quality.

Toluol: Naked, 3s. 4d. per gallon nominal; North, 3s. 2d.; pure, 4s.

Creosote: London, 1s. 2½d. to 1s. 3½d.; North, 1s. 2½d.; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 1s. 3d. to 1s. 4d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 5s. per ton f.o.r. makers' works.

Pyridine: 18s. to 22s. 6d. per gallon.

Aniline Oil: 1s. 7d. per lb., drums extra.

Aniline Salts: 1s. 9d. per lb.

Cresylic Acid: Crude, 2s. 6d.; dark 95-97%, 3s. 3d.; 97-99%, 3s. 7d., per gallon, drums free.

Carbolic Acid: Crude 60%, 2s. 3d. per gallon; crystals 40%, 8d. per lb. nominal.

Salicylic Acid: Technical, 2s. 3d.; B.P., 2s. 10d. per lb.

Xylol: Pure, 5s. 3d.; commercial, 4s. 6d. per gallon.

Resorcin: 12s. to 13s. per lb.

Alizarine 20%: 2s. per lb.

B. Naphthol: 3s. per lb.

Sulphate of Ammonia.

There is very little fresh to report in this market, and very good business is being executed at £23 16s. for January delivery, £24 3s. 6d. for February, and £24 11s. for March to May. Export prices are gradually coming down to the level of home quotations; and as production of sulphate is fairly well maintained, it is quite likely that it will be possible to conduct larger export business in the near future.

Keighley Gas Profits.

In the Keighley Town Council, last Wednesday, the Chairman of the Gas Committee (Mr. W. H. Murgatroyd) submitted the accounts of the department for the year ended June 30 last. They showed a net profit of £6492; whereas the profit anticipated at the beginning of the year had been £2800. After deduction for transference to the general district rate in respect of public lighting, there was a surplus of £4346, making a total surplus of £8858 when added to that of the previous year. Coal, wages, and bonuses had cost an extra £12,494; but the income from sale of coke had increased by £6540, and tar had yielded an extra £1859, notwithstanding the fact that the previous year £4738 had been received for tar delivered before June, 1918. The increase in yield of tar had been a great help. The make of gas was 404 million c.ft., a record in the history of the works. With the exception of a gasholder, which would have to be replaced before long, the plant was in a very satisfactory condition; and the Committee therefore proposed to add to working capital account £2500 from the surplus, making a total in that account of £12,500. The sum of £4000 was proposed to be added to the reserve and renewals fund; and £50 was donated to the local hospital. The balance of £2308 was to be carried forward. The report was approved. In regard to the grant to the hospital, it was agreed that, if the Gas Committee could have an additional representative on the Hospital Committee, an appeal for increased subscriptions would be considered; and the matter was referred to the Gas Committee.

Improved Show-Rooms at Newcastle.

At the present time, the chief offices of the Newcastle and Gateshead Gas Company in Grainger Street West are being altered in order to provide a large and up-to-date show-room. Shortly before the commencement of the war, the Company opened show-rooms in Northumberland Street; but later it was considered desirable, in the interests of freeing labour for war purposes, to suspend endeavours to increase sales of gas appliances, and therefore the show-room was closed. The experience gained, however, led to the conclusion that it was more in the interests of both the Company and the consumers that the show-room should be in the same building as the chief offices. When the war terminated, the question of developing sales of gas and gas appliances again arose, and with it the question of the provision of show-rooms. It was therefore decided at the beginning of the year to put in hand the work referred to. Hitherto the Company had not occupied the whole of their large block of buildings in Grainger Street West; but in order to meet the new conditions it was necessary to make drastic alterations. Practically the whole of the heavy internal walls from roof to foundation have been removed, and a framework of steel substituted; the result being to give on the ground floor one fine, lofty saloon covering the whole area of the building. The architectural treatment of this hall is of a refined order, and specially designed for show-room purposes. Extensive shop windows are being introduced for external display; and demonstrations of the uses and application of gas will be a feature of the service that is being organized.

The Board of Trade Still Deprecate Action against Gas Undertakings.

A report by the Town Clerk of Bournemouth states that under the Bournemouth Gas (Standard of Calorific Power) Order of 1917, gas of a calorific power of 500 B.Th.U. per c.ft. is prescribed. The provisions of this Order are at present, in effect, in abeyance owing to the situation brought about by the war, and pending the carrying into operation of the provisions of the Gas Regulation Act of 1920. During the state of emergency declared owing to the coal strike, a standard of 450 B.Th.U. was allowed. This state of emergency no longer exists; and the existing standard under the Order—500 B.Th.U—is restored. The Board of Trade, however, in June, 1919, renewed the request contained in their letter of December, 1918, that councils should refrain from taking proceedings against gas undertakings in respect of deficiencies of calorific power, so long as it did not fall below 450 B.Th.U., and so long as the proportion of inert constituents was not excessive. The Board of Trade stated, in reply to a further inquiry, that, while not formally renewing the requests contained in earlier letters, they still found it necessary to deprecate, in view of the coal situation, any action being taken at present which would compel gas undertakings to use more coal in the production of gas. It has already been reported to the Committee that the Gas Company could, at an increased charge, raise the calorific value of the gas; but it was pointed out, and the Committee recognized the fact, that such an increase in calorific power could not be at all in proportion to the greater price which would have to be charged.

Flood at a Gas-Works.—The River Nedd overflowed its banks last Saturday, and flooded the Neath Corporation Gas-Works. The stokers worked on rafts to keep the fires in; and the Manager (Mr. W. Clark Jackson) and his staff had to wade through the water and enter the office by means of a ladder.

Shale Treatment in France.

Speaking at the meeting of the Var Oil and Coal Company, Ltd., the Chairman (Mr. Leslie Urquhart) said that the existence of oil shale and coal on the Company's French properties was discovered about sixty years ago. At the point on which operations are now being concentrated, the shale seam is of very fine quality. A recent analysis has recorded a yield of 130 gallons of crude oil per ton of shale; the crude oil being of excellent quality, and free from sulphur. Preliminary operations indicate that the average yield previously assumed, of 50 gallons of crude oil per ton of shale, will prove in practice to be a most conservative one—everything pointing to this average being very largely exceeded. As soon as the full mining programme is commenced, large additional reserves of shale should be quickly disclosed. Recent prospecting operations have given evidence of the probable extension of the shale seam beyond the southern boundary of the concessions; and rights have, therefore, been secured over a large additional area, where boring operations will shortly be commenced. On the formation of the Var Company, the French properties were equipped with six vertical retorts; and two small horizontal retorts of an improved type were in course of erection. During the past few months, numerous tests of the shale have been conducted in both types of retorts; the data thus obtained indicating that better results from the retorts of the horizontal rotary type may be anticipated. These tests are being continued; and when completed a definite decision as to the type of retort best suited for the treatment of the rich Boson shale will be come to, and orders placed for the number required to treat an initial minimum quantity of 300 tons of shale daily. This question of the right type of retort to adopt has been rendered of greater importance since the acquisition by the French company of the Autun shale concessions, which cover more than 2500 acres.

Bolton District Threatened Strike.—A strike of gas-workers is threatened at Bolton. The result of the ballot taken locally gave a majority of ten to one in favour of ceasing work on the 12th inst., unless there is a satisfactory settlement of the wages question. In the event of the strike materializing, the districts involved will be Bolton, Bury, Farnworth, Leigh, Atherton, Radcliffe, and Mossley.

Swadlincote Gas Undertaking.—The annual report of the Swadlincote gas undertaking shows that for the year the income from sales of gas, residuals, &c., increased from £12,588 to £15,825, or about 26 p.ct. On the other hand, the working expenses were £12,077, against £8636, showing an increase of nearly 40 p.ct. The total wages bill for the year was £3093, against £1935 in the previous year, or an increase of nearly 60 p.ct. There was a gross profit of £3827, and a net deficiency of £1362. The total consumption of gas for the year, including that supplied for public lighting and used on the works, was 47,583,800 c.ft., against 44,189,400 c.ft. a year ago. The quantity unaccounted-for was 20 p.ct., as compared with 14 p.ct. in the previous year. The make per ton of coal was 12,909 c.ft., against 12,068 c.ft.

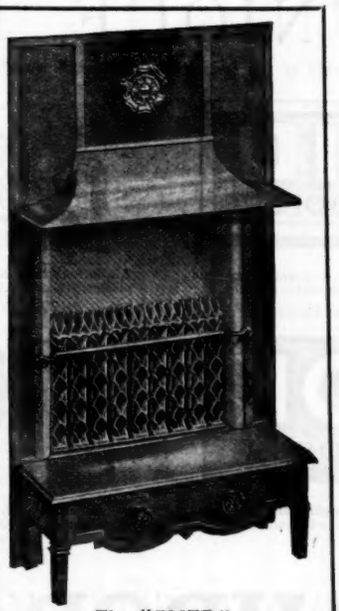
Low-Temperature Carbonization, Ltd.

The third annual meeting of shareholders was presided over by Colonel Sir Henry E. F. Goold-Adams, K.B.E., who stated that undoubtedly the low-temperature carbonization of coal may now be regarded as an accomplished fact; and its national importance is being more and more appreciated every day by the technical as well as by the general Press. It is clear that this country cannot afford to go on wasting its coal by burning it in its crude form, thereby losing untold millions of money annually. Recently the Board had visited Barnsley, and witnessed the working of the new retorts which have in every detail replaced those originally erected at the works. The experience was of the most gratifying character. The plant was working smoothly—and smokelessly—and the results obtained from the crude coal, which takes an average of eight hours to carbonize, were found to be satisfactory. The solid resultant fuel is good in every respect. It contains a minimum of "breeze," is sufficiently hard to be easily transportable, and is absolutely smokeless; while, so far as it is at present possible to ascertain definitely, the gas is rich in quality and high in volume, and the oils and ammonia are all that has ever been claimed, alike as to quality and quantity. At present the Barnsley plant consists of twenty retorts, with a capacity for treating some 25,000 tons of coal per annum. The bye-product portion of the plant is completed to deal with four times this quantity—that is, 100,000 tons of coal per annum—and with further capital it can be extended to an even greater capacity. The Company are satisfied that they have now in operation a successfully working commercial plant. The Chairman explained that his own position on the Board of the Company was due to the fact that, as a result of the investigations undertaken by the Nitrogen Products Committee (of which he was Chairman), he was convinced that the process of the Company is scientifically sound, and consequently doing work of great national importance.

Fire at the Derby Gas-Works.—Damage was done by a fire which occurred last Friday at the Litchurch works of the Derby Gas Company. On the arrival of the fire brigade, it was found that the roof of the power-house and the belt-race in the pit-shaft situated under the house were well alight. A good supply of water was, however, obtained from the canal near the works; and the flames were soon subdued. The damage is covered by insurance. The cause of the outbreak is unknown.

Birkenhead Gas-Works Extension Scheme.—Consequent upon the increased cost of materials and wages, it is estimated that the gas-works extension scheme which is being undertaken by the Birkenhead Corporation will involve an expenditure of £44,453 more than the estimate framed in February, 1919; and the Council are to be asked to authorize an application to the Ministry of Health for power to borrow this amount, as well as the sum of £20,400 required for the purifying plant and connections for the gas undertaking.

There is a Main Fire for every buyer.



The "ELITE."

When conditions permit the fitting of a complete Gas Interior the "Elite" will give entire satisfaction and secure unity between the gas fire and its structural setting.

Of pleasing design in the Tudor style, embodying the patent silent burner, injector, and other internal details of the noted "Entente" Fire.

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WORKS: Gothic Works, EDMONTON, N. 18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W. 1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 6, Narrow Wine Street, BRISTOL; 333, Queen Street, MELBOURNE.

Petrol to be Cheaper.—On Jan. 1, there was a reduction of 7d. per gallon in the price of petrol in Great Britain; so that No. 1 quality will sell at 3s. 5½d., and the cheaper grade at 3s. 3½d. per gallon, with the usual additional penny for Scotland. This reduction is in consequence of the removal of the 6d. duty imposed in 1915.

New Carbonizing Plant for Perth.—Sanction has been received by the Perth Town Council from the Secretary for Scotland to the borrowing of £65,000 for the purpose of the installation of a system of vertical retorts at the gas-works. Objection to the scheme was raised by a number of ratepayers, and forwarded to the Scottish Office; but after inquiry and careful consideration, it was decided to accede to the application made by the Council.

Chapel Whaley Gas Dividend.—For the past two years, the Directors of the Chapel-en-le-Frith, Whaley, and District Gas Company have been handicapped somewhat seriously by pre-war regulations in connection with the payment of dividends. The report for the past year showed that the Company were in a position to pay 3¾ p.ct., and they desired to do so; but it was subsequently found that this was impossible, as the Board of Trade had not granted the necessary permission. A dividend of 2½ p.ct. was therefore paid; but the Directors state that it may be taken for granted that this is the last time they will not have a free hand in recommending such a dividend as the accounts justify.

Coal Famine in Victoria.—A Reuter message from Melbourne, dated last Thursday, states that a serious coal famine prevails in Victoria, owing to the New South Wales miners having carried out their threat to prevent any coal entering the first-named State unless the Victorian Government would agree to pay the Morwell brown coal miners the minimum wage of 16s. 6d. per day granted by a Special Tribunal in September to all coal miners other than the brown coal miners. Drastic restrictions have been imposed regarding the use of coal, coke, gas, and electricity; and industry generally is likely to be at a standstill after the holidays. Train and tram services were to be reduced as from Jan. 4.

Shipley and a Gas Supply for Baildon.—The Baildon Urban District Council have asked the Shipley Urban District Council for terms on which they will supply gas for street lighting, and for new houses under construction. The price quoted was necessarily high. At a meeting of the Shipley Council, it was contended by the Chairman that the capital outlay would be so heavy that the income from the consumption of gas would not pay even the annual charges, so there would not be any payment for gas at all. He said the same difficulty had arisen in Shipley; and the Gas Committee had had to make a condition that there must be a payment annually, or a contribution towards the capital cost. The deputation from Baildon had undertaken to place the facts before their Council, and subsequently inform the Shipley Council whether Baildon would be prepared to make-up the loss which was inevitable if all the outlay were borne by the gas undertaking.

Keighley Gas-Works Success.—The annual report of the Keighley Corporation Gas Department shows a net profit of £6492. The sum of £2146, representing the cost of public lighting, has been transferred to the district rate, leaving a disposable surplus of £4346. The balance brought forward from last year makes a total credit balance of £8858. The Committee recommend confirmation of the transfer to the relief of the rates, a donation of £50 to the Victoria Hospital, the transfer of £2500 to working capital account, and £4000 to reserve and renewals fund, and the remaining £2308 to be carried forward to next year.

Reduction in Price of Sulphuric Acid.—The reduction in the price of sulphuric acid foreshadowed by Mr. Milne Watson in his address at the annual meeting of the National Gas Council is intimated by the "Chemical Trade Journal" in the following terms: The Committee, under the chairmanship of Mr. T. Glover, appointed by the Central Executive Board of the National Gas Council to consider with the National Sulphuric Acid Association the question of the prices of spent oxide and sulphuric acid, have made their report; and it is announced that the Association have agreed to reduce the price of acid made from spent oxide from £6 2s. 6d. to £5 10s. per ton, as from Jan. 1.

Bilston Gas Light Company.—The Directors regret that, owing to the abnormal increase in the cost of coal, labour, and materials, they have been compelled to increase the price of gas to a point which, in accordance with the sliding-scale clause in the Company's Act, necessitates a *pro rata* reduction in the dividend. The profit and loss account, after paying the interim dividends, shows a credit balance of £16,676. It is proposed to pay further dividends of 4s. 9d. per share on the "A" shares, less tax, and 3s. 3d. per share on the "B" shares, less tax (making, with the interim dividends, 9s. 6d. per share and 6s. 6d. per share respectively, less tax for the year). This will leave a balance of £15,080.

Fire at the Derbyshire Silica Works.—A serious fire occurred at the works of the Derbyshire Silica Fire-Brick Company, Ltd., near Hartington, on Tuesday evening, the 28th ult.; but the extent of the damage was considerably exaggerated in the notices in the daily press. The manufacture of the fire-bricks and special shapes is carried on in sheds which are arranged in separate units. Fortunately, the fire was confined to one of these; and it is expected that half the manufacturing plant will be again in operation in a few days. Every effort is being made to grapple with the situation. Luckily, the kilns, sand-sheds, workshops, pattern stores, and offices have escaped all damage. It will, therefore, be possible to maintain a good proportion of the output during the time the machinery is being repaired and the roofs rebuilt. When the repairs are complete, vigorous measures will be taken to reduce the loss of output to the bare minimum. It is expected that the damaged sections will be rebuilt in three to four months' time; and during reconstruction the output will be steadily increased as the damaged sections are replaced. The damage is covered by insurance. The origin of the fire is unknown.

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'THE KEENEST CRITICS HAVE BEEN CONVINCED THAT WHAT IS NOW PUT BEFORE THEM IS THE TRUTH."

THE TORBAY & DART PAINT COMPANY, Ltd., 26-28, Billiter St., LONDON, E.C.3

At a meeting of shareholders held last month in Sheffield, it was decided that British Tar Products, Ltd., should be wound-up voluntarily.

Mrs. Crane, of Wealdstone, Harrow, died in Hendon Infirmary from burns caused through her jumper catching fire while she was making tea at a gas-stove.

The villagers of Gorsey Bank, near Wirksworth, have erected a memorial street gas-lamp, on the base of which are the names of the soldiers from the village who fell in the war.

A verdict of "Suicide" was returned at Bradford in the case of Jane Darwin, who had been found dead on a couch, her head covered with a shawl, with a tube carrying gas from the bracket.

At a special meeting last week of preference and ordinary shareholders in Messrs. C. & W. Walker, Ltd., it was resolved to increase the dividend on the preference shares from 5½ to 7½ p.c. per annum, non-cumulative, and to issue additional preference shares.

Business premises illuminated by gas at Barrow-in-Furness gained a decided advantage one day last week, when the electricity supply broke down for most of the evening, and many shops were left in darkness.

The Bolton Corporation General Purposes Committee have decided not to grant applications made for increases in salary by officials in the gas and other departments, on the ground that the position had already been met by previous advances.

At Huddersfield, last Friday, Charles Dobson, of Leeds, was sent to prison for terms amounting altogether to six months, on charges of obtaining money by false pretences. It was stated that he had represented himself to be travelling as agent for Bray's gas-burners; and he always insisted on payment in advance. He got money from several small hardware traders in this way. In Court, the man denied that he had said he represented Bray. There were 25 previous convictions against him, and many warrants for his arrest were in existence in this country and in Scotland.

STOCK MARKET REPORT.

THE closing week of 1920—a year which few business people will regret to have seen the last of—was not a very trying one on the Stock Exchange. Business naturally was on a much-reduced scale in the four days sandwiched between two holiday breaks; but the improved tone which marked the close of the preceding week was continued, and the House re-opened on Tuesday in a fairly cheerful mood. This was maintained, and business even became a little more active until Thursday, when the reappearance of some pressure to sell imparted a shock. However, this was surmounted the next day, and leading departments were calm and firm.

A gratifying feature was the recovery in the gilt-edged market. Government issues of all descriptions were in excellent demand, and prices steadily advanced. The last prices of the big four were: Consols 44¼-45, War Loan 82⅜-83½, Funding 67⅜-68¼, Victory 72⅛-72⅜. Bonds were strong, and Corporation issues firm. Indian loans also improved. Home Rails were a bit uncertain at starting; but soon took the up-line, and continued to the close. Canadians made some improvement, and Argentines were for the most part steady.

The Foreign Market had its strong and its weak points. In the former category were French, Belgian, Italian, and Greek; and in the latter, Russian, Brazilian, and Japanese.

The Miscellaneous Market was rather better, although Rubber and Oil were alarmed by liquidations on Thursday.

Business in the Gas Market was almost in a state of quiescence; the aggregate for the week being about enough to represent one good day's transactions. The general tone was firm. In the London Companies, Gas Light and South Metropolitan ordinaries rose 1 each. Commercial was unchanged. In Suburban and Provincial, the only move was a fall in Brighton and Hove original. Imperial Continental on Thursday was quoted *ex* the interim dividend of 20 p.ct. declared at the recent meeting. Nine debenture stocks of home and foreign companies were also quoted *ex div.*

Bargains done for cash during the week were as follows: On Tuesday, Gas Light ordinary 52½, 53, 53⅜, ditto preference 56, 56⅜, Imperial Continental 131, 132¼, Metropolitan of Melbourne 87, South Metropolitan 60, Bath Gas Light and Coke 59, 60. On Wednesday, Commercial 4 p.ct. 53½, Gas Light ordinary 53¼, 53⅜, 54, ditto 10 p.ct. bonds 128⅛, Imperial Continental 130, 131, 131½, 131⅜, 132¼, ditto debenture 91. On Thursday, Gas Light ordinary 54, 54¼, 54½, ditto debenture 46⅜, ditto 10 p.ct. bonds, 133, Imperial Continental *ex div.* 112½, 113, 114, South Metropolitan 59⅜, 60½. On Friday, Brentford "B" 47½, Gas Light ordinary, 54, Imperial Continental 112½, 114, and (exceptional bargain) 131½, Primitiva preference 20s. 3d., South Metropolitan 60, South Suburban 55, Southampton ordinary 56½.

In the Money Market, there was the usual strong demand for money in the closing week of the year. But, somewhat unexpectedly, available supplies came in which were fully, if not more than, equal to the demand. Thus there was never at any time an embarrassing pressure for accommodation, and at the close the situation was one of marked ease. Discount business was of very moderate proportions. Silver was rather jumpy. It rose on Wednesday to 43d. and fell back on Friday to 40⅝d. The Bank rate is 7 p.ct., fixed on April 17 last.

Damage to the extent of several hundreds of pounds was done to premises and stock at a Bradford wool warehouse, last week, by a fire which broke out as a result of the bad operation of an electric motor connected with a crane.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 27	4	4%	Aldershot 4 p.c. Pref.	...	56—61	...
1,551,868	,,	Oct. 14	2½	3⅛%	Alliance & Dublin Ord.	59—64	38—43	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	4%	Bombay, Ltd.	5⅞—6⅛	4¼—4¾	...
100,000	5	Aug. 12	16	5%		...	8—9	...
383,110	10	,,	7	7%	Bourne- mouth Gas and Water { 5 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	15—15½	8½—9½	...
115,000	10	,,	6	7%		13⅜—14	7⅜—8½	...
162,065	—	Dec. 30	—	6/-		...	61—63*	...
992,045	Stk.	July 14	14	4%	Brentford A Consolid.	261—266	50—55	...
734,920	,,	,,	11	30/-	Do. B New	204—209	47—52	47½
55,000	,,	,,	5	26/3	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	Dec. 15	4	5%	Do. 4 p.c. Deb.	92—93	58—60	...
214,775	,,	Aug. 27	11	4%	Brighton & Hove Orig.	208—213	100—110	...
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	75—85	...
1,287,500	Stk.	July 29	5	5½%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 15	12½	5%	British	44—45	20—22	...
120,000	Stk.	Dec. 30	4	10%	Do. 4 p.c. Deb. Stk.	88—90	55—57*	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	37—40*	...
100,000	10	May 27	—	4%	Cape Town & Dis., Ltd.	2½—2¾	7—7½	...
100,000	10	Dec. 10	—	4%	Do. 4½ p.c. Pref.	4—6	5—6	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	54—59*	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Aug. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	53—56	53½
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	47—52	...
475,000	,,	Dec. 15	3	5%	Do. 3 p.c. Deb. Stk.	69½—71½	42—45	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	25—30	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	40—50	...
51,600	,,	Aug. 27	14½	10½%	Croydon A 10 p.c.	...	125—135	...
278,400	—	—	6	5%	Croydon B and C 7 p.c.	...	90—100	...
492,270	Stk.	,,	11½	7½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	...	...
16,298,975	Stk.	July 29	4/17/4	30/-	Gas Light { 4 p.c. Ord. 3½ p.c. max. and 4 p.c. Con. Pref. Coke 3 p.c. Con. Deb. 10 p.c. Bonds.	98—102	53—56	52½—54½
2,600,000	,,	,,	3½	26/3		76—79	36—39	...
4,062,235	,,	,,	4	4%		96—99	55—58	56—56½
4,674,850	,,	Dec. 15	3	3%		72½—74½	44—47	46½—133
130,000	,,	Dec. 11	10	10%	Hastings & St. L. 5 p.c.	...	...	...
82,500	,,	Sept. 15	5	3½%	Do. 3½ p.c.	87—89	53—58	...
258,740	,,	,,	3½	2½%	Hongkong & China, Ltd.	16½—16¾	37—39	...
70,000	10	May 13	11	8%	Hornsey 7 p.c.	...	8½—9½	...
86,600	Stk.	Sept. 15	9	5½%	Ilford A and C	151—154	87—89	...
131,000	,,	Aug. 12	7½	4½%	Do. B	115—118	79—84	...
65,780	,,	,,	6½	3½%	Do. 4 p.c. Deb.	92—94	57—62	...
65,500	,,	Dec. 30	4	4%	Imperial Continental	150—160	54—56*	...
4,940,000	,,	,,	9	4½%	Do. 3½ p.c. Deb. Red.	84—86	110—115*	112½—132½
1,235,000	,,	Aug. 12	3½	3½%	Lea Bridge Ord. 5 p.c.	119—121	90—95	91
235,242	,,	Sept. 15	6½	5%	Liverpool 5 p.c. Ord. { A. B.	211—213	80—85	...
2,498,905	,,	Feb. 26	10	37/6	Do. 4 p.c. Pr. Deb. Stk.	146—148	...	...
306,083	,,	June 26	4	4%	Maidstone 5 p.c.	...	...	...
165,736	,,	Aug. 12	7/5/6	3½%	Malta & Mediterranean	...	...	...
75,000	5	June 11	6	3%	Met. of Melbourne 4½ p.c. Deb.	4¼—4½	52—57	...
250,000	100	Oct. 1	4½	4½%	Monte Video, Ltd.	99—101	1¾—2¼	...
541,920	Stk.	Nov. 26	4	6%	Newcastle & Gatsh'dCon.	11⅜—12	86—93	87
1,875,892	,,	July 29	4½	3½%	Do. 3½ p.c. Deb.	98½—99½	68—73	...
539,705	,,	June 25	3½	3½%	North Middlesex 10 p.c.	82—83	60—61	...
15,000	10	Sept. 15	—	8%	,, 7 p.c.	...	50—51	...
55,940	10	,,	7/14/0	5⅞%	Oriental, Ltd.	14—15	12½—13½	...
300,000	Stk.	Nov. 26	8	8%	Ottoman, Ltd.	117—122	7—7½	...
60,000	5	Mar. 26	10	1/-	Portsea Island, B	7½—7¾	93—96	...
60,000	50	Aug. 27	13	7½%	Do. C	128—131	2—3	...
100,000	50	,,	12	6½%	Primitiva Ord.	118—121	65—70	...
249,980	5	April 29	8	—	Do. 5 p.c. Pref.	5½—6	50—55	...
499,960	5	June 26	5	—	Do. 4 p.c. Deb.	4½—5	⅛—¼	...
521,600	100	Dec. 1	4	4%	Do. ,, ,, 1911	91—93	¼—1¼	20/3
600,000	Stk.	July 29	4	4%	River Plate 4 p.c. Deb.	...	67—69	...
346,198	,,	Dec. 30	4	4%	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	85—87	40—42	...
150,000	10	Sept. 30	6	6/-		10½—11	35—39*	...
125,000	50	July 2	5	5%	Sheffield A	47—49	6¾—7¼	...
135,000	Stk.	Aug. 27	10	5%	Do. B	223—224	38—40	...
209,984	,,	,,	10	5%	Do. C	222—224	60—63	...
523,500	,,	,,	10	4%	Shrewsbury 5 p.c.	220—222	57—59	...
133,201	Stk.	Sept. 15	4	4%	South African	...	54—57	...
90,000	10	Sept. 30	9	9%	South Met. Ord.	10½—11½	...	...
6,609,895	Stk.	Aug. 12	5/4/0	30/-	Do. Red. Pref.	111—113	10½—11½	...
250,000	,,	July 14	—	5%	Do. 3 p.c. Deb.	...	59—62	59¾—60½
1,895,445	,,	,,	3	3%	South Shields Con. Stk.	72½—74½	91—93	...
224,820	,,	Aug. 27	8½	3%	S'th Suburb'n Ord. 5 p.c.	157—159	45—48	...
1,087,795	,,	July 29	6	3½%	Do. 5 p.c. Deb. Stk.	114—116	95—96	...
247,558	,,	Dec. 30	5	5%	Southampton Ord.	116—118	56—61	55
647,740	,,	Nov. 12	7½	3½%	Do. 4 p.c. Deb. Stk.	99—102	65—70*	...
121,275	,,	Dec. 30	4	4%	Tottenham { A 5 p.c. B 3½ p.c. District 4 p.c. Deb.	...	55—58	56½
120,000	,,	Aug. 12	—	3½%		135—138	57—59*	...
782,275	,,	,,	6	2½%		115—117	60—65	...
181,255	,,	Dec. 15	4	4%		87—89	50—55	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	55—58	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	1—2	...
236,476	Stk.	Sept. 15	5	3½%	Tynemouth 5 p.c. max.	108½—109	45—50	...
30,000	,,	Aug. 27	8½	47/6	Wandsworth, Wimbledon, and Epsom—		69—71	...
255,636	,,	,,	6½	32/6	Wandsworth A 5 p.c.	151—156	.75—80	...
108,075	,,	,,	—	33/3	Do. B 3½ p.c.	129—134	53—58	...
140,865	,,	,,	—	33/3	Do. C	...	50—55	...
352,000	,,	,,	6½	26/3	New Ordinary	...	50—55	...
98,000	,,	,,	6½	32/6	Wimbledon 5 p.c.	117—122	43—48	...
88,416	,,	Dec. 30	3	3%	Epsom 5 p.c.	121—126	50—55	...
					3 p.c. Deb. Stk.	66—69	43—45*	...

* Ex Div.

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